

Perspective-Taking and Hindsight Bias

by

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Abstract

Participants read a vignette about a woman and man from a self (first-person) or other (third-person) perspective and predicted the likelihood of several outcomes. Later, they learned positive (marriage proposal), negative (rape), or no outcome information before recalling their original predictions and completing a memory questionnaire designed to investigate whether they misremembered details stereotypical of the outcome they learned. Perspective did not affect memory. Alternatively, outcome information did affect memory; however, only participants who learned negative outcome information exhibited hindsight bias, misremembering their initial likelihood ratings as being more consistent with the outcome than their original ratings actually were. Furthermore, performance on the vignette task did not correlate with performance on a standard paradigm for measuring hindsight bias. While taking another's perspective rather than one's own perspective may not make an outcome seem more or less predictable, learning negative outcome information likely makes an outcome seem more predictable in hindsight.

Keywords: hindsight bias; self-relevance; outcome valence

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Chapter 1.

Introduction

In the early hours of June 12, 2016, Omar Mateen opened fire at Pulse nightclub in Orlando, Florida. By the time he was killed by police, he had taken the lives of 49 victims and severely wounded another 53, marking the deadliest mass shooting in U.S. history. When a tragic event such as the mass shooting at Pulse nightclub occurs, people often look back and wonder, “should we have seen this coming?” It is a natural human tendency to ponder the past and wonder if there were warning signs. After this particular incident, media outlets devoted much time to outlining the “unmistakable” warning signs that Mateen would execute this murderous plot. Media were quick to reveal that his school records showed that he was in constant trouble, that he had added his wife to his life insurance policy just months prior to the shooting, and perhaps most importantly, that the FBI had carried out an investigation on him three years earlier (Perez, Brown, & Almasy, 2016). In fact, one source claimed that “...as details emerge about Mateen’s radical behavior, hindsight is revealing numerous warning signs, and the heat on the FBI is increasing” (Zimmerman, 2016). It is possible that this attack could have been prevented had people recognized the warning signs. However, with the aid of hindsight, it is much easier to look back on an outcome, and pick out those warning signs because one knows exactly how the event unfolded. When individuals perceive an outcome as more obvious and the preceding warning signs as more relevant once the outcome is known, a cognitive error known as *hindsight bias* has likely contributed to their judgments.

Hindsight bias occurs when outcome knowledge influences one’s beliefs about what they could have, should have, or did know or believe about an outcome, or its preceding events, before the outcome was known (Christensen-Szalanski & Willham,

1991; Fischhoff, 1975, 1977; Guilbault, Bryant, Brockway, & Posavac, 2004). For example, hindsight bias may occur when individuals believe that an outcome was more foreseeable once they have learned the outcome (*hindsight*) than before they knew what the result would be (*foresight*) (Roese & Vohs, 2012). When hindsight bias exists, outcome knowledge makes it challenging for an individual to return to his or her original naïve state, or the state prior to learning the outcome. Thus, the new knowledge may bias an individual's memory of his or her original knowledge.

1.1. Assessing and Measuring Hindsight Bias

1.1.1. Hindsight bias designs

There are two major ways to assess hindsight bias—the *memory* design and the *hypothetical* design. The major difference between these is whether participants make two separate judgments (one in foresight and one in hindsight) or just one judgment (either in foresight or in hindsight) about the outcome or correct answer to some event or question. In the memory design, participants first make judgments about the answer or outcome (hereafter singularly referred to as “outcomes”) of some event or question, without any knowledge of what the actual outcome is. After making their original judgments, participants eventually learn the actual outcome, also referred to as “outcome information,” to some event or question. Now armed with outcome information, participants attempt to recall their original judgments, a process that involves inhibiting their current knowledge of the actual outcome. Participants exhibit hindsight bias if, after learning outcome information, they recall their original judgments as being closer to the correct judgments than their original judgments actually were in foresight. Conversely, when individuals do not learn outcome information, they either accurately recall their original judgments or their recall of their original judgments shifts randomly, with some responses moving toward the correct answer and some moving away.

In the hypothetical design, there are typically two between-subject conditions: (1) a foresight condition and (2) a hindsight condition. In the foresight condition, participants do not learn outcome information before making judgments about the outcome to some event or question. Conversely, in the hindsight condition, participants learn outcome information before making judgments about what they would have originally predicted had they not known the outcome. Thus, participants in both conditions only make one judgment, rather than two separate judgments as is the case for the memory design. The judgments made by participants in the hindsight condition (i.e., those who possess outcome information) are compared to the judgments made by participants in the foresight condition (i.e., those who do not possess outcome information). The foresight condition serves as a control group while the hindsight condition serves as the experimental group. Research using hypothetical designs typically demonstrates that judgments made by those in the hindsight condition lie closer to the correct judgments than the foresight condition's judgments. Hypothetical designs generally produce more hindsight bias than memory designs (Davies, 1992; Powell, 1988; Pohl, 2007).

1.2. Hindsight bias paradigms

Certain tasks are commonly used to study hindsight bias. For example, one of the most standard tasks for measuring hindsight bias is a trivia item paradigm in which participants try to answer a set of difficult trivia questions. These questions require numerical responses that lie on a continuous scale. Participants first provide their *original judgments* (term first developed by Erdfelder and Buchner, 1998) for each of the questions. Then, after some delay, participants learn the *correct judgments* to half the questions. The questions for which participants learn the correct judgments are the experimental items, while the questions for which participants receive no feedback are the control items. Finally, participants attempt to recollect their original judgments for all experimental and control items, and these recalled judgments are referred to as their *recall of original judgments* (Erdfelder & Buchner, 1998; Hell, Gigerenzer, Gauggel, Mall, & Müller, 1988; Bayen, Erdfelder, Bearden, & Lozito, 2006).

In studies using trivia item paradigms, participants exhibit hindsight bias when after learning outcome information, their recall of their original judgments has shifted away from their original judgments and toward the correct judgments. For example, if asked, “What year did Leonardo da Vinci create Mona Lisa,” a participant may respond with “1420.” If this particular question was an experimental item, the participant would later be asked to recall her original judgment about when da Vinci painted Mona Lisa after learning that the correct judgment is actually 1503. After learning outcome information, she may recall her original judgment as “1490.” This shift away from the original judgment and toward the correct judgment is hindsight bias. If that participant had instead responded with “1400” after learning that da Vinci painted Mona Lisa in 1503, she would show a reverse hindsight bias, because her original judgment has shifted in the opposite direction from the correct judgment. Finally, if that participant had accurately recalled her original judgment of “1420”, she would show no hindsight bias. If the same question was instead a control item, the participant would not learn outcome information before recalling her original judgment. Therefore, she would either be expected to accurately recall her original judgment or to shift her response towards or away from the correct judgment (this shift would be expected to be random across multiple control items). Thus, there should be a systematically larger shift in judgments towards the correct judgments for experimental items than for control items. Research has shown that when using a memory design, hindsight bias is greatest when participants learn outcome information immediately before recalling their original judgment than it is when participants learn outcome information earlier, such as directly after making their original prediction (Hell et al., 1988).

Another common task used to assess hindsight bias involves presenting participants with a scenario, typically depicting imaginary or real events, and asking them to judge the likelihood of various outcomes to the scenario. For example, participants might read a scenario about a battle between two armies and then rate the likelihood of each army winning. If using the hypothetical design with this task, participants in the experimental condition would learn outcome information after reading the scenario. Conversely, participants in the control condition would read the same scenario but would not learn

outcome information. Then, all participants would rate the likelihood of various outcomes; however, participants in the experimental condition would be asked to indicate what they would have believed the likelihood of the various outcomes to be had they not known the actual outcome. The experimental condition's judgments would be compared to the control condition's judgments in order to determine whether outcome information led to hindsight bias. The experimental condition would be expected to rate the likelihood of the outcome they learned as greater than in the control condition and greater than the other possible outcomes.

1.3. Measuring hindsight bias

There are several ways to measure hindsight bias (Pohl, 2007). Most commonly, hindsight bias is measured in terms of *magnitude*. For the memory design, hindsight bias magnitude is a measure of the degree to which participants' recall of their original judgments shifts toward the correct judgments after learning outcome information. Thus, participants exhibit a greater magnitude of hindsight bias as their recall of their original judgments shifts further away from their original judgments and toward the correct judgments. For the hypothetical design, hindsight bias magnitude is a measure of the degree to which the experimental condition's judgments differ from the control condition's judgments. If outcome information influences hindsight judgments, participants in the experimental condition would be expected to have responses more consistent with the outcome information they learned when compared with participants in the control condition.

Pohl (1992; 1995) developed a proximity index in which hindsight bias is computed for each item by subtracting the absolute difference between participants' recall of their original judgment and the correct judgment from the absolute difference of participants' original judgment and the correct judgment. Using this index, participants will receive a zero if their original judgment and recall of their original judgment are the same. Participants will receive a positive score if their recall of their original judgment is closer

to the correct judgment than their original judgment is. Finally, participants will receive a negative score if their recall of their original judgment is further from the correct judgment than their original judgment is. Then, researchers may calculate either the mean or median magnitude of all experimental items and all control items separately to produce a single measure of hindsight bias for each set of items.

There is some debate over whether perfect recollections (i.e., when participants correctly recall their original judgments) should be included in the calculation of overall hindsight bias magnitude (Coolin, Bernstein, Thornton, & Thornton, 2014; Pohl, 2007). A perfect recollection of one's original judgment on an item will result in a hindsight bias magnitude of zero for that item. Thus, including perfect recollections when calculating overall hindsight bias magnitude can systematically lower the apparent degree to which participants exhibited hindsight bias, particularly for individuals who recalled many of their original judgments. However, failing to include perfect recollections in calculating hindsight bias magnitude could also artificially increase the apparent degree to which participants show hindsight bias on a particular task. These potential consequences make it challenging to determine whether to include perfect recollections in calculating hindsight bias magnitude.

1.4. Hindsight Bias Theories

Several theories have been proposed to explain the effects of hindsight bias. Table 1 summarizes the basic tenets of the major hindsight bias theories.

Table 1. Hindsight bias theories.

Hindsight bias theory	Basic Tenets of Theory	Relevant Literature
Hindsight bias is comprised of three separate hindsight components	(1) <i>Memory distortion</i> : outcome information biases one's recollections of their original predictions about an outcome	Blank, Nestler, von Collani, & Fischer, 2008 Blank & Peters, 2010

Hindsight bias theory	Basic Tenets of Theory	Relevant Literature
	<p>(2) <i>Foreseeability impressions</i>: outcome information biases one's beliefs about the predictability of an outcome</p> <p>(3) <i>Inevitability impressions</i>: outcome information biases one's beliefs about how certain an outcome appears to have been</p>	Nestler, Blank, & Egloff, 2010
Cognitive Reconstruction	<p>(1) <i>Recollection</i>: the process of attempting to recall one's original judgment after learning outcome information</p> <p>(2) <i>Knowledge updating</i>: the process of integrating outcome information into one's existing knowledge base</p> <p>(3) <i>Sense-making</i>: the process of focusing on information consistent with outcome information while ignoring outcome-inconsistent information in order to make sense of the outcome</p>	<p>Hawkins & Hastie, 1990</p> <p>Roese & Vohs, 2012</p>
Anchoring and adjusting	Individuals <i>anchor</i> onto outcome information and <i>adjust</i> their original predictions about the outcome to be consistent with their current knowledge of the outcome	<p>Fischhoff & Beyth, 1975</p> <p>Hawkins & Hastie, 1990</p>
Motivational factors	Individuals are motivated to exhibit hindsight bias either to increase their sense of control over their world, enhance their self-esteem, or absolve themselves of responsibility for a negative outcome	<p>Campbell & Tesser, 1983</p> <p>Hawkins & Hastie, 1990</p> <p>Roese & Vohs, 2012</p>

Hindsight bias theory	Basic Tenets of Theory	Relevant Literature
Defensive processing theory	To minimize their responsibility for a negative outcome, individuals for whom the negative outcome is self-relevant report the outcome as less foreseeable and exhibit less hindsight bias than do individuals for whom the outcome is not self-relevant	Louie, 1999 Mark & Mellor, 1991 Pezzo & Pezzo, 2007
Retroactive pessimism theory	Because it is easier to accept a negative outcome they could not have prevented, individuals for whom the negative outcome is self-relevant report the outcome as more inevitable and exhibit more hindsight bias than do individuals for whom the outcome is not self-relevant	Sanna and Chang, 2003 Tykocinski, Pick, & Kedmi, 2002 Tykocinski & Steinberg, 2005

Hindsight bias has been called different names such as “the curse of knowledge” (Camerer, Loewenstein, & Weber, 1989), and the “knew-it-all-along effect” (Wood, 1978). Furthermore, hindsight bias has often been conceptualized as a single phenomenon, with the defining feature being the influence of outcome knowledge on judgments about what one knew in foresight. Recently, some researchers have begun to argue that hindsight bias is comprised of three separate components: memory distortion, foreseeability impressions, and inevitability impressions (see e.g., Blank, Nestler, von Collani, & Fischer, 2008; Blank & Peters, 2010; Nestler, Blank, & Egloff, 2010). The first component, *memory distortion*, occurs when outcome information biases one’s recollections of their original predictions about outcomes, such that their hindsight judgments move away from their foresight judgments and toward the correct judgments. For example, memory distortion is commonly measured and observed using the classic trivia item paradigm. Memory distortion is believed to rely on several memory processes (e.g., Nestler et al., 2010 proposed five memory processes), but most certainly involves both a *recollection* and a *reconstruction bias* (discussed below).

According to Blank and colleagues, the second component of hindsight bias is *foreseeability* impressions. This component is a measure of the extent to which an individual believes they could have predicted an outcome (“I knew it all along”). These types of judgments should concern only what an individual could have objectively known prior to the outcome. However, sometimes estimations of foreseeability are made in hindsight, and thus, rely on subjective estimations of what an individual thought he/she or another person knew before an outcome occurred. Foreseeability is commonly measured using tasks that require participants to read the facts of a hypothetical or real event. In the experimental condition, participants would learn outcome information and then rate how likely it is that they would have predicted various outcomes or how obvious various outcomes were, including the outcome they learned. In the control condition, participants would learn no outcome information, and instead would judge the predicted foreseeability of various outcomes. Individuals show hindsight bias when their estimations of foreseeability are greater in hindsight than in foresight.

The third component of hindsight bias, *inevitability* impressions, is a measure of how certain an outcome appears to have been. Inevitability is commonly measured using tasks whereby participants judge the probability of various outcomes after reading a vignette. Participants in the experimental condition would learn outcome information before judging the probability of various outcomes, and would be asked to rate the probability of the various outcomes as if they did not know the actual outcome. Participants in the control condition would not learn outcome information before judging the probability of the various outcomes. Hindsight bias, in terms of inevitability impressions, occurs when individuals estimate an outcome’s inevitability as greater in hindsight than in foresight.

These three components (memory distortion, foreseeability impressions, and inevitability impressions) can either independently or jointly produce hindsight bias. For example, foreseeability and inevitability can be distinguished from memory distortion: while individuals’ recall of original judgments may be influenced by outcome information, their beliefs about the perceived foreseeability or inevitability of the outcome may remain

uninfluenced. Similarly, inevitability can be distinguished from foreseeability in that one's impressions of the "objective state of the world" (inevitability; Blank & Peters, 2010, p. 357) may be influenced by outcome information whereas one's subjective impressions about the predictability of an outcome (foreseeability) may not change as a result of learning outcome information.

Other theories propose different processes believed to contribute to hindsight bias. For example, according to the multinomial processing tree model of hindsight bias, recollection bias and reconstruction bias are the underlying processes that contribute to hindsight bias, or at least to the memory distortion component (Coolin, Erdfelder, Bernstein, Thornton, & Thornton, 2014; Erdfelder & Buchner, 1998). When a participant aims to recall their original judgment, they will start by attempting to directly recall their original judgment. However, if outcome information interferes, they cannot accurately recall their original judgment. This results in a recollection bias, whereby participants more accurately recall their original judgments on items for which they did not learn outcome information than on items for which they did learn outcome information. If a participant cannot directly recall their original judgment, they must reconstruct their original judgment. When participants use outcome information as an anchor for reconstructing their original judgment, this results in a reconstruction bias, whereby participants' recalled judgments systematically shift toward the correct judgments on items for which they learned outcome information.

A similar theory suggests that hindsight bias is the result of *cognitive reconstruction* (Hawkins & Hastie, 1990), which according to Roese & Vohs (2012) is comprised of three major memory processes. The first memory process is *recollection*, which is the process of attempting to recall one's original judgment after learning outcome information. The second memory process is *knowledge updating*, which involves integrating outcome information into one's existing knowledge base. The third memory process is *sense-making*, the process by which people focus on information that is consistent with the known outcome while ignoring outcome-inconsistent information. This process was originally described by Fischhoff (1975) as "creeping determinism," which occurs when people learn

outcome information and then work to make sense of how the preceding events led to the outcome.

Many studies have examined this sense-making process (Roeser & Olson, 1996; Wilson, Gilbert, & Centerbar, 2003; Pezzo, 2003). It seems to contribute to hindsight judgments about how predictable an outcome was in foresight. As people focus their attention on reasons for which the outcome had to occur, the outcome becomes seemingly more predictable. In some cases, people may even misremember pre-outcome events that did not occur, but that are typically associated with a particular outcome in order to make sense of the outcome. For instance, Carli (1999) had participants read a vignette describing the relationship between a man and a woman. Some participants then learned that the vignette ended with a marriage proposal, while other participants learned that the vignette ended with a rape. Carli found that after learning outcome information, participants misremembered pre-outcome events consistent with the outcome they learned but that did not explicitly occur in the vignette they read. For example, participants who learned that the vignette ended with a rape were more likely to misremember that the man and woman had met at a bar. However, this detail was never actually stated in the vignette, and is rather, a stereotypical belief about events that can precede rape.

Hindsight judgments may also involve an *anchoring and adjusting* process (Hawkins & Hastie, 1990). In this process, individuals anchor onto outcome information and adjust recall of their original predictions about the outcome to be consistent with their current knowledge of the outcome. However, this theory cannot fully account for hindsight bias for a few reasons. For one, if anchoring and adjusting fully accounted for hindsight bias, then one would expect that the amount of bias someone showed after learning an outcome did not occur would be equal to the amount of bias someone showed after learning an outcome did occur. This is because in both cases, individuals have a specific number to anchor onto. In the case of an outcome occurring, they can anchor on 100%. Alternatively, in the case of an outcome not occurring, they can anchor on 0%. Participants then should adjust their original predictions to be more consistent with that anchor. However, this does not occur. Researchers typically find that hindsight bias is larger when participants learn

that an outcome occurred than when they learn that an outcome did not occur (Fischhoff, 1977; Fischhoff & Beyth, 1975).

Other literature has suggested that *motivational factors* are involved in hindsight bias (Campbell & Tesser, 1983; Hawkins & Hastie, 1990; Roese & Vohs, 2012). For example, individuals have a desire for predictability and order in their world, which may motivate people to believe an outcome was more predictable once the outcome is known, rather than believing there was no way they could have predicted that outcome (Walster, 1967). If individuals shift their beliefs about the predictability of an outcome, it may give them the impression that they have more control over outcomes in their life. Hindsight bias may also be motivated by a desire to enhance or protect one's own self-esteem. There are several ways this could occur. For example, in response to learning the correct judgment to a trivia question, an individual may be motivated to enhance his self-presentation by believing, and thus recalling, his pre-outcome prediction as being closer to the correct judgment than it was in actuality.

Another way hindsight bias may enhance one's self-esteem is if she perceives a favorable outcome as more foreseeable and/or inevitable in hindsight than in foresight. Consider, for instance, Linda who is nervous about whether she is qualified for a position she interviewed for and is unsure if she will receive a job offer. After being offered the position, however, Linda believes she was bound to get the job. In this case, she is motivated to perceive the outcome as more likely in hindsight because it implies that her qualifications distinguished her as a candidate for the position. Hindsight bias may also work to protect Linda's self-esteem in the face of a negative outcome. For example, if Linda did not receive the job offer, she may come to believe that she did not have any control over the situation and that the outcome was inevitable, thus increasing hindsight bias, but only in terms of the inevitability component. Believing that an outcome was inevitable, and thus that she had no control over the outcome, may reduce Linda's sense of responsibility for the outcome, therefore protecting her self-esteem. Two factors may be particularly important to motivational hindsight bias explanations: (1) outcome valence and

(2) the self-relevance of the outcome. Because the present study is concerned with investigating these two motivational explanations further, I explore these theories next.

1.4.1. Outcome valence

Hindsight bias studies often observe how individuals are influenced by an outcome that is not personally relevant to them; that is to say, an outcome that someone else experienced (Alicke, Davis, & Pezzo, 1994; Henrikson & Kaplan, 2003; Pezzo & Pezzo, 2007). In these studies, the type of outcome information that participants learn may be manipulated, so that it is either positive, negative or neutral in nature. While research typically finds that participants will show hindsight bias consistent with the outcome information they learn (i.e., their hindsight judgments are impacted by outcome knowledge), the magnitude of that bias may be larger for negative outcomes than for positive or neutral outcomes (Blendon et al., 2002; Groebe, 2011). For example, in a study conducted by Schkade and Kilbourne (1991), participants read several scenarios about employees working on various projects. Participants either learned positive or negative outcome information about the outcome of each project. Schkade and Kilbourne discovered that despite all other details in the scenario being identical (i.e., same performance history and same actions taken to complete the project), participants who learned negative outcome information rated the outcome as significantly more foreseeable than participants who learned positive outcome information.

In some cases, positive outcomes might either lead to similar hindsight bias magnitude as negative outcomes, or perhaps to even greater hindsight bias. Again, most of this research examines the impact of various types of outcome information on individuals evaluating an outcome another person has experienced. It seems that “when reviewing another’s decision, hindsight can occur irrespective of whether the outcome is positive or negative” (Louie, 1999; p. 29). However, this may not be the case for self-relevant outcomes.

1.4.2. Self-relevance of outcome

How outcome information affects one's beliefs about the predictability of an outcome may, in some part, depend on whether an outcome is personally relevant to that individual. According to the literature on the self-serving bias (Bradley, 1978; Miller & Ross, 1975; Zuckerman, 1979), people have a tendency to take credit for outcomes that reflect favorably on them and to avoid blame for outcomes that reflect unfavorably on them. Thus, when reflecting on past events that are self-relevant, individuals may recollect information in a way that serves their personal interests or enhances their self-regard (Ross & Wilson, 2002). From this stance, it could be expected that when a self-relevant outcome is positive, individuals will show more hindsight bias compared to when the outcome is negative. This is because by retrospectively judging a positive outcome as being more foreseeable, individuals give themselves more credit for the outcome. In fact, some studies have demonstrated this finding. In a study conducted by Louie (2005), participants read a case about a company and decided whether they would invest stock in that company. Then, participants either received favorable feedback (stock increased if they invested or decreased if they did not invest), unfavorable feedback (stock decreased if they invested or increased if they did not invest), or no feedback. Participants who received feedback subsequently made postdictions about what they would have estimated the price of stock to have been had they not read the case history of the company. Those who received no feedback made predictions about what they would have believed the price of stock to be had they not read the company's case. Louie discovered that only participants who received favorable feedback exhibited hindsight bias; that is, their estimations about the stock price were biased toward the outcome information they learned compared to those who received unfavorable feedback or no feedback.

Because research has typically found increased hindsight bias for positive self-relevant outcomes, one might expect the opposite for negative self-relevant outcomes. In other words, compared to a person for whom a negative outcome is not self-relevant, an individual who experiences a negative self-relevant outcome would be expected to exhibit decreased hindsight bias so as to avoid blame for the negative outcome. For example, if a

person is fired from his job, he may perceive the outcome to have been less foreseeable than one of his coworkers might have. This is because the person who was fired would want to minimize his responsibility for that outcome. However, there are discrepancies in the literature about whether this is actually the case. People do “appear to selectively seek causes that minimize their culpability” (Pezzo & Pezzo, 2007, p. 150). However, this may occur in various ways that impact hindsight bias differently. There are two main theories behind how people react to a negative self-relevant outcome, and subsequently, whether they show hindsight bias as a result.

The first theory is “defensive processing.” This theory suggests that individuals will report a negative self-relevant outcome as less foreseeable in hindsight because they want to minimize their responsibility for the negative outcome (Louie, 1999; Mark & Mellor, 1991; Pezzo & Pezzo, 2007). The notion here is that if a negative outcome was foreseeable, then they should have done something to avoid it. Thus, if they retrospectively judge the outcome as less foreseeable, then they assure themselves that they could not have acted any differently to avoid the negative outcome. This particular theory accords with the self-serving bias proposition.

Some studies have found that compared to participants evaluating a negative outcome that another person has experienced, participants evaluating a negative self-relevant outcome show less hindsight bias. For example, Mark and Mellor (1991) investigated how the self-relevance of a job layoff impacted participants’ judgments about the foreseeability of the layoff. Participants included laid-off workers (for whom the negative outcome was most self-relevant), workers who had survived the layoff, and community members (for whom the outcome was least self-relevant). Mark and Mellor found that the laid-off workers rated the layoff as less foreseeable than workers who had survived the layoff, who rated the outcome as less foreseeable than community members. Apparently, as the outcome became less self-relevant for participants, it subsequently became more foreseeable.

The other theory for how people react to a negative self-relevant outcomes is “retroactive pessimism.” This theory proposes that hindsight bias is actually greater for a negative self-relevant outcome than it is for a negative outcome that is not self-relevant. The main tenet of this theory is that it might be easier for people to accept an outcome that was inevitable and therefore impossible for them to prevent. For example, if an employee is fired from her job, she might convince herself that there was nothing she could have done to prevent being fired since it was inevitable given company downsizing and her low-ranking position (Sanna & Chang, 2003; Tykocinski, Pick, & Kedmi, 2002; Tykocinski & Steinberg, 2005). In a study by Tykocinski (2001; study 2), participants rated the likelihood of different candidates winning an election. They were asked to rate the likelihood of success for each candidate before and after the election, and the difference between these two judgments served as the hindsight bias measure. When participants chose the losing candidate (i.e., negative outcome), they exhibited greater hindsight bias than participants who voted for the winning candidate (i.e., positive outcome).

Whether hindsight bias decreases or increases following a negative self-relevant outcome may be dependent upon how hindsight bias is being measured. For example, Pezzo and Pezzo (2007) suggest that defensive processing occurs because, “...in order to avoid culpability for a negative outcome, people perceive—or at least report—the event as unforeseeable” (p. 148). Alternatively, they suggest that retroactive pessimism is a product of “...convinc[ing] ourselves of the negative outcome’s inevitability” (p. 148). Thus, Pezzo and Pezzo indirectly imply that the defensive processing explanation only applies to judgments about the foreseeability of a negative self-relevant outcome and retroactive pessimism only applies to judgments about the inevitability of a negative self-relevant outcome. After finding evidence that the foreseeability component of hindsight bias could be distinguished from the inevitability component, Blank and Peters (2010) suggested and tested the idea that hindsight bias may decrease only when the foreseeability component is being measured, while hindsight bias may increase only when the inevitability component is being measured. They found evidence to support this notion; participants exhibited no

hindsight bias in terms of the foreseeability component and significant hindsight bias in terms of the inevitability component.

To directly test the interaction of outcome valence and self-relevance on hindsight judgments, Mark, Boburka, Eyssell, Cohen, and Mellor (2003) compared differences in “retrospective judgments of foreseeability” among participants who learned positive or negative outcome information that varied in self-relevance. Participants proceeded in groups of three, with two participants playing a stock market game in which they bought stock, while a third participant observed the game. During the game, one of the players either learned a positive outcome (that their stock had greatly increased) or a negative outcome (that their stock had greatly decreased). The researchers believed that the outcome would be most self-relevant for the player who received either positive or negative outcome information about their stock. Conversely, they believed the outcome would be less self-relevant for their opponent and least self-relevant for the observer. Mark et al. (2003) found that participants who learned negative self-relevant outcome information rated the outcome as less foreseeable than their opponents or the observers. However, there were no differences in retrospective foreseeability ratings for the positive outcome between participants for whom the outcome was self-relevant and those for whom it was not.

This is one of the very few studies that directly examine interactions between outcome valence and outcome self-relevance on retrospective judgments of foreseeability. It provides evidence that the type of outcome information people learn as well as the personal relevance of the outcome may influence hindsight bias. However, because Mark et al. (2003) did not collect foresight judgments about the foreseeability of the outcome or include a condition in which participants learned no outcome information, it is unclear whether their effects constitute hindsight bias. Thus, further research is needed to determine the effect of outcome valence and outcome self-relevance on hindsight bias.

1.5. Hindsight bias in legal decision making

Hindsight bias can have many implications in our everyday lives. For example, hindsight bias affects how we update our knowledge—as Pezzo and Pezzo (2007) suggest, while outcome information may produce “some degree of hindsight bias,” it “should help people become better calibrated for future decisions” (p. 149). As our beliefs about various events or facts become more consistent with the correct judgments than they once were, we develop our own knowledge base. However, some researchers worry that because of hindsight bias, we might not be able to learn from our past mistakes. If we believe we always could have predicted a negative outcome, how will we adjust our behavior in the future?

There are circumstances in which hindsight bias can have serious consequences; for example, in our legal system. There are many opportunities for hindsight bias to occur throughout the course of legal proceedings. Judges, juries, witnesses, and experts are charged with the challenging task of evaluating some past event while attempting to ignore significant negative outcome information. Consider, for instance, a defendant who is being sued for negligence. As our legal system stands, defendants are only to be judged based on their conduct prior to the negligent act. Thus, triers should only consider what the defendant knew prior to the outcome, and if the damage or injury caused to the plaintiff was a foreseeable consequence of the defendant’s actions. That is, should they have foreseen the outcome, and if so, what should they have done to avoid it? However, the nature of the legal system requires triers to evaluate these past actions and events once the negative outcome is known. This has been empirically demonstrated with negligence judgments where mock triers who do not learn outcome information rate the outcome as less foreseeable and the defendant as less negligent than those who learn about the negative outcome before making their judgments of liability (see e.g., Groebe, 2011; Hastie & Viscusi, 1998; Hastie, Schkade, & Payne, 1999; Kamin & Rachlinski, 1995). Given that researchers have consistently demonstrated that outcome information influences ones’ judgments of the predictability of an outcome, hindsight bias can lead to very dangerous,

and biased, legal decisions (Harley, 2007; Arkes, Wortmann, Saville, & Harkness, 1981; Hastie et al., 1999).

Hindsight bias may also influence expert opinion, which can have dangerous consequences for judgments made in the legal context. For example, experts testifying in legal proceedings may overestimate the foreseeability of a particular outcome and lead triers to believe that a different decision should have been made (Arkes et al., 1981; Henriksen & Kaplan, 2003). Consider, for instance, a medical malpractice case in which a radiologist is being sued for failing to detect a tumor. Other radiologists may be asked to review the original images, and provide expert opinion on whether the radiologist breached a standard of care by failing to detect the tumor. However, when these experts review the original images, they have full knowledge of the outcome (i.e., that the patient has cancer). Thus, they are more likely to be able to detect the tumor in the original images, and overestimate the likelihood that the original radiologist should have been able to detect the tumor (Muhm, Miller, Fontana, Sanderson, & Uhlenhuth, 1983). Other areas of law that are potentially impacted by the effects of hindsight bias continue to emerge; research has found that hindsight bias can affect decisions made in patent law, criminal law, and forensic investigations, among other areas of law (Casper, Benedict, & Kelly, 1988; Evelo & Greene, 2013; Giroux, Coburn, Harley, Connolly, & Bernstein, in press; Goodwill, Alison, Lehmann, Francis, & Eyre, 2010; Mandel, 2006).

Most studies of hindsight bias in legal judgments investigate how hindsight bias impacts triers' evaluations of a defendant's and/or victim's actions, and few examine whether hindsight bias occurs in victims/complainants or accused/defendants—that is to say, the people who were personally involved in the negative outcome. However, it is important to consider whether there are differences in hindsight bias among those who have personally experienced an outcome versus those evaluating an outcome another person has experienced. It may be the case that from an outsider's hindsight perspective, a negative outcome seems more predictable than it actually was to the people who experienced the outcome. If that is the case, evaluators may overestimate a victim or defendant's ability to have prevented the outcome, which could lead to biased legal judgments.

On the other hand, it may be that from the perspective of the person who personally experienced the outcome, the outcome seems more likely in hindsight. However, compared to those who did not personally experience the outcome, the person for whom the outcome is self-relevant may hold different beliefs about whether he/she could have prevented the outcome. A negative self-relevant outcome could either lead to defensive processing, in which an individual believes there was no way to have foreseen that outcome (reducing the magnitude of hindsight bias), or to retroactive pessimism, in which an individual convinces him or herself that the outcome was inevitable and his/her actions could not have altered the outcome (increasing the magnitude of hindsight bias). Differences in hindsight bias may arise from differences in the perspective from which one evaluates an outcome.

1.6. Current Study

There are mixed findings in the literature about how the outcome valence, as well as the self-relevance of an outcome, affect hindsight bias. Further, there is little research examining how the outcome valence and the self-relevance of an outcome interact and the subsequent consequences on hindsight bias. Given these mixed findings, a couple of questions directed my research. The first is whether there is a difference in the magnitude of hindsight bias people exhibit based on the type of outcome information (i.e., outcome valence) they learn—specifically, is there a difference in hindsight bias for positive versus negative outcomes? The second question is whether hindsight bias differs among people who personally experience an outcome versus those evaluating an outcome that another person has experienced, and if so, how does it differ? Finally, I was interested in whether there was an interaction between the outcome valence and the self-relevance of an outcome, and how this might impact hindsight bias.

The goal of the present study was to replicate and extend the findings from Carli's (1999) study. In Carli's study, participants first read a vignette which described the relationship between a man named Jack and a woman named Barbara. At the end of the vignette, half the participants learned a positive outcome (Jack proposed to Barbara), while

the remaining participants learned a negative outcome (Jack raped Barbara). After a two-week delay, participants were presented with four possible outcomes to the vignette they had read in the previous session: (1) Jack proposed to Barbara, (2) Jack raped Barbara, (3) Jack and Barbara began dating, and (4) Jack and Barbara had a one-night stand. They were asked to rate the likelihood of each of these outcomes on a nine-point rating scale as if they did not know the actual outcome. Carli found that participants exhibited hindsight bias consistent with the outcome they learned; participants who learned that Jack proposed to Barbara rated that positive outcome as more likely than participants in the negative outcome condition and alternatively, participants who learned that Jack raped Barbara rated that negative outcome as more likely than participants in the positive outcome condition. Therefore, the first objective of this study was to replicate Carli's finding that participants show hindsight bias consistent with the outcome information they learn.

I made a few modifications to Carli's methodology in order to extend her findings. First, instead of using a hypothetical hindsight design, I used a memory design. In Carli's study, participants only made one judgment about the likelihood of various outcomes being the ending to the vignette, and this judgment was made after they had learned outcome information. Alternatively, in the present study, participants were asked to provide both foresight and hindsight judgments about the likelihood of the various outcomes to the vignette. This modification was made in order to assess whether Carli's results would replicate if participants were asked to make two separate judgments—one before learning outcome information and one after learning outcome information. Recent research suggests that hindsight bias can be measured/observed in terms of memory distortion, foreseeability and inevitability. While Carli's hypothetical measure of hindsight bias most likely captured the inevitability component because participants were asked to rate the likelihood of various outcomes, it is possible that using a memory design would lead to different findings. These findings could lend support to the premise that the memory distortion component can be distinguished from the inevitability component. Thus, using a memory design instead of a hypothetical design allowed us to test this particular theory. Furthermore, memory designs often produce smaller effects than hypothetical designs

(Pohl, 2007); thus, whether Carli's findings would replicate with a memory design may indicate the strength of the effect that outcome information had on participants' original beliefs about the outcome.

The second modification I made to Carli's methodology was the addition of a third outcome condition. In Carli's study, there were two experimental outcome conditions; participants either learned positive or negative outcome information. However, without a no outcome control condition, there are limitations on what one can conclude about the effect of outcome information on participants' original predictions, as well as the direction of those effects. One would expect that learning positive outcome information would lead participants to rate the positive outcome as more likely in hindsight and learning negative outcome information would lead participants to rate the negative outcome as more likely in hindsight. Alternatively, one would expect that learning no outcome information would result in participants either accurately recalling their original predictions or shifting randomly in the direction of either the positive or negative outcome. Thus, I added a third outcome condition in which participants did not learn any outcome information, therefore serving as a control for the experimental conditions.

The third modification I made to Carli's methodology was adding a perspective manipulation to the vignette. Little research has been conducted to compare the magnitude of hindsight bias exhibited by people who have personally experienced an event versus those evaluating an event that another person has experienced. Furthermore, little research has examined whether perspective-taking affects hindsight bias. Therefore, a main goal of the present study was to evaluate whether there are differences in hindsight bias exhibited among participants who have been asked to imagine personally experiencing an event (self-perspective condition) versus those who have been asked to imagine another person experiencing an event (other-perspective condition). This manipulation was intended to address the question of whether perspective-taking is related to hindsight bias and also to extend our understanding of whether evaluating a self-relevant, or a personally experienced, outcome affects hindsight bias differently from evaluating an outcome another person has experienced. Thus, another objective of my study was to investigate

whether hindsight bias differed among participants in the self- and other-perspective conditions.

In addition to rating the likelihood of various outcomes to the vignette they read, participants in Carli's study also completed a memory questionnaire. The questionnaire assessed both their memory for the vignette, as well as whether participants misremembered details about the vignette that were stereotypically consistent with the outcome that they learned. Carli found that participants misremembered a significant number of details stereotypically consistent with the outcome they learned (i.e., participants in the positive outcome condition misremembered more details stereotypically consistent with a marriage proposal than participants in the negative outcome condition; participants in the negative outcome condition misremembered more details stereotypically consistent with a rape than participants in the positive outcome condition). Thus, another objective of the current study was to replicate Carli's finding that participants misremember details about the vignette that are stereotypically consistent with the outcome information they learn. Because all participants in Carli's study read the vignette from a third-person perspective, she was not able to investigate whether there were any differences in the details misremembered among participants for whom the vignette was self-relevant versus those evaluating the vignette from an other perspective. Thus, another aim of this study was to determine if there were any differences in the number of outcome-consistent details that are misremembered among those in the self- and other-perspective conditions.

The fourth and final modification made to the experimental design was the addition of a trivia task. This trivia task was included for two reasons. Firstly, it was intended to create interference between participants' memory of their original likelihood ratings for each of the vignette outcomes and their recall of their original ratings once they had learned the actual outcome. Secondly, trivia items are a standard paradigm used to assess hindsight bias. Thus, whether participants show hindsight bias on the trivia task should indicate their propensity towards exhibiting hindsight bias in general. Given this, the final objective was to determine whether participants' hindsight bias magnitude on the vignette task would correlate with their hindsight bias magnitude on the trivia task.

Overall, I expect to find the following:

1. Participants who learn outcome information will exhibit hindsight bias consistent with the outcome they learn. Specifically, participants in the positive and negative outcome conditions will recall their original likelihood ratings for the *consistent* outcome (i.e., Jack proposed to Barbara or Jack raped Barbara) as being higher than their original likelihood ratings actually were for that outcome and/or they will recall their original likelihood ratings for the three *inconsistent* outcomes (i.e., Jack raped Barbara or Jack proposed to Barbara; Jack and Barbara began dating; Jack and Barbara had a one-night stand) as being lower than their original likelihood ratings actually were for those outcomes. I expect that participants who do not learn outcome information will either accurately recall their original likelihood ratings, or their recall of their original likelihood ratings will shift randomly.
2. Participants who learn outcome information will misremember details that were not explicitly stated in the vignette, but that are stereotypical of the outcome they learn. Specifically, participants who learn positive outcome information will be more likely than those who learn negative or no outcome information to misreport non-presented details that are stereotypically associated with a marriage proposal. Conversely, participants who learn negative outcome information will be more likely than those who learn positive or no outcome information to misreport non-presented details stereotypically associated with a rape.
3. The effects described in predictions 1 and 2 will be larger in the group of participants randomly assigned to read the vignette from the self perspective than from the other perspective.
4. Hindsight bias magnitude on the vignette task will correlate with hindsight bias magnitude on the trivia task.

Chapter 2.

Method

2.1. Participants

An a priori power analysis using the G*Power 3 statistical software (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that a total of 132 participants was necessary to observe the expected effects with a power of .95 and a medium effect size of .2. To ensure there was enough usable data, I aimed to test 160 female participants (see below for justification of why only female participants were included). Overall, 235 undergraduate students from two universities in British Columbia participated in this study. Two hundred and ten participants completed both sessions. Forty-seven of the participants who completed both sessions were males and 163 were females. However, only females were included in analyses because it was predicted prior to data collection that men would not be able to assume the perspective of the main character of the vignette given that she was a woman, and the vignette described her relationship with a man. Twelve females were excluded from analyses either because they did not pass the manipulation check described below ($n = 8$), because they provided incomplete data for the vignette task ($n = 1$), or because they received the wrong set of materials for the second part of the study ($n = 3$). Thus, a total of 151 female participants were included in analyses. The participants had a mean age of 20.45 years ($SD = 5.45$). Participants either received course credit or extra credit for their time.

2.2. Measures

2.2.1. Vignette

The fictional vignette used in this study (see Appendix A) was adapted from Carli's (1999) study. Only minor changes were made to the vignette to make it more

geographically relevant to the particular sample of students participating in the current study (i.e., locations mentioned in the vignette developed by Carli were changed to reflect locations that the participants would be familiar with). Also, a perspective manipulation was added to the vignette; participants were either instructed to read the vignette from the first-person perspective or from the third-person perspective. As a manipulation check, participants were asked at the end of the study whether they understood how to read the vignette from the perspective they were assigned. Participants who responded “no” were excluded from analyses.

The vignette was three pages in length. The first page contained a description of a woman named Barbara. The last two pages depicted the relationship between Barbara and a man named Jack. The narrative was written from Barbara’s perspective, and described a series of events that transpired between Barbara and Jack. Unlike the vignette Carli used, this vignette had no clear ending in terms of the outcome of their relationship. Instead, participants rated the likelihood of each of four possible outcomes to the vignette (see Appendix B) on a scale from 1 (not at all likely) to 9 (very likely).

Of the four possible outcomes for which participants provided likelihood ratings, one was the positive outcome that one third of participants would eventually learn (Jack proposed to Barbara), one was the negative outcome that one third of participants would eventually learn (Jack raped Barbara), and two were filler outcomes that no participants would learn (Jack and Barbara began dating; Jack and Barbara had a one-night stand). Participants in the experimental conditions (positive and negative outcome information) responded to these items on two separate occasions, once before learning outcome information, and once after (see Appendix C for outcome information that participants in the positive and negative outcome conditions learned). Participants in the control condition (no outcome information) also responded to these items on two separate occasions; however, they did not learn outcome information before making their second set of judgments. Outcomes were counterbalanced and appeared in a different order the second time they were presented.

It was expected that if outcome knowledge influenced participants' recall of their original judgments about the likelihood of the vignette outcomes (i.e., if they showed hindsight bias), it could be demonstrated in two possible ways. First, they would exhibit hindsight bias if, for the outcome *consistent* with the outcome information they learned, they recalled their original judgments as being greater in magnitude than their original judgments for that outcome actually were. For example, if a participant originally judged the likelihood of Jack proposing to Barbara as a 4, and then learned the positive outcome information, she would show hindsight bias if she recalled her original judgment about Jack proposing to Barbara as 5 or above. Thus, if participants demonstrated hindsight bias for the outcome consistent with the outcome information they learned, the difference between their recalled judgment and their original judgment would be positive. To measure hindsight bias magnitude for the consistent outcome, a difference score was calculated between participants' original judgments and their recall of their original judgments as follows:

$$CO\ ROJ - CO\ OJ$$

*Note: CO = Consistent outcome, ROJ = Recall of original judgment, OJ = Original judgment.

Participants might also exhibit hindsight bias if for the three *inconsistent* outcomes (i.e., the outcomes they did not learn), they recalled their original judgments as being smaller in magnitude than their original judgments for those outcomes actually were. For example, say a participant originally rated the likelihood of Jack proposing to Barbara as a 4 and then learned the negative outcome information. That participant would show hindsight bias if she recalled her original judgment about the likelihood of Jack proposing to Barbara as a 3 or below. Thus, if participants showed hindsight bias for the inconsistent outcomes, the difference between their recalled judgments and their original judgments for those outcomes would be negative. In order to measure hindsight bias magnitude for the inconsistent outcomes, a difference score was calculated between the average of participants' recall of their original judgments for the three inconsistent outcomes and the average of their original judgments for those same three outcomes as follows:

$$\left(\frac{IO\ ROJ1 + IO\ ROJ2 + IO\ ROJ3}{3} \right) - \left(\frac{IO\ OJ1 + IO\ OJ2 + IO\ OJ3}{3} \right)$$

*Note: IO = Inconsistent outcome, ROJ = Recall of original judgment, OJ = Original Judgments and the numbers 1, 2, and 3 in the numerator refer to each of the three inconsistent outcomes.

Participants who did not learn outcome information were dummy coded either as if they had learned the positive outcome or as if they had learned the negative outcome. Based on which outcome participants in the no outcome condition were coded as having learned, their hindsight bias magnitude for the consistent and inconsistent outcomes was measured accordingly. Perfect recollections were included in the calculation of hindsight bias magnitude. All participants received both an outcome-consistent and an outcome-inconsistent difference score. Then, I subtracted participants' outcome-inconsistent score from their outcome-consistent score for a measure of overall hindsight bias magnitude as follows:

Hindsight bias on consistent outcome – Hindsight bias on inconsistent outcomes

2.2.2. Memory Questionnaire

The memory questionnaire used in this study (see Appendix C) was the same questionnaire used in Carli's study. The questionnaire consisted of 52 true/false items. Twenty-four of the 52 items assessed participants' memory for what actually occurred in the vignette. The remaining 28 items described details that did not occur in the vignette, but rather, that are stereotypically associated with rape (e.g., "Barbara and Jack met at a bar;" n = 14) or marriage proposals ("Jack wanted Barbara to meet his parents;" n = 14). I calculated the average percentage of correct responses on the memory questionnaire, the average percentage of details stereotypically consistent with marriage proposals misremembered, and the average percentage of details stereotypically consistent with rape misremembered.

2.2.3. Trivia Task

The trivia task used in this study (see Appendix D) was adopted from Coolin et al., 2014. The task consisted of 40 arcane trivia items, which required participants to respond with numerical answers lying on continuous scales. The unit of measurement in which participants were expected to respond for each item was presented with the question. For example, if the question was “what is the distance (in kilometers) between New York and Los Angeles?” the answer would be “4,546 kilometers.” There were no limits in terms of the magnitude of numbers with which participants could respond. Question order was fixed.

Items on which participants either gave no original judgment, gave no recall of their original judgment, or both were eliminated from analyses. Similarly, items on which participants responded with a range of values (e.g., “20-30” or “1980’s”) for either their original judgment, recall of their original judgment, or both were eliminated from analyses. This eliminated 4.39% of the data for the trivia task. Perfect recollections were not included in the calculation of hindsight bias magnitude (note: the data pattern remains the same when perfect recollections are included).

To measure hindsight bias magnitude, I used Pohl’s Δz index (Pohl, 2007). This index is particularly useful in this case for a couple of reasons: (1) it allows one to measure the extent to which outcome information biases participants’ recall of their original judgments and (2) it allows one to make comparisons across items using different scales of measurement by standardizing participants’ responses for each item. With this index, it is expected that participants’ recall of their original judgments will systematically shift away from their original judgments and toward the correct judgments on items for which participants learn the correct judgments (experimental items) but not for control items (random or no change was expected on these items). This shift is measured by comparing the difference between a participant’s original judgment and the correct judgment to the difference between that participant’s recall of her original judgment and the correct judgment.

To calculate hindsight bias using Pohl's Δz index, I first computed the absolute difference between participants' original judgments and the correct judgments for each of the 40 trivia items as follows:

$$|OJ - CJ|$$

*Note: OJ = Original judgment, CJ = Correct judgment

To standardize item scales, I divided each participant's resulting difference score on a given item by the standard deviation of all participants' difference scores on that item. I did this individually for each participant for each of the 40 items.

Next, I computed the absolute difference between participants' recall of their original judgments and the correct judgments for each item as follows:

$$|ROJ - CJ|$$

*Note: ROJ = Recall of original judgment, CJ = Correct judgment

Once again, I divided each participant's resulting difference score on a given item by the standard deviation of all participants' difference scores on that item for all 40 items.

I then subtracted the standardized difference between a participant's recall of her original judgment and the correct judgment from the standardized difference between a participant's original judgment and correct judgment for each of the 40 items for each participant as follows:

$$|\overline{OJ} - \overline{CJ}| - |\overline{ROJ} - \overline{CJ}|$$

*Note: The overbars are used to represent the standardized differences between participants' original judgments and the correct judgments and between participants' recall of their original judgments and the correct judgments, as described above.

For each item on which a participant recalled her original judgment as being closer to the correct judgment than her original judgment was, there should be a positive Pohl's index score. Thus, if participants exhibit hindsight bias, the overall magnitude of Pohl's index scores for experimental items should be greater than the overall magnitude of Pohl's index scores for the control items. Finally, I computed the median of each participant's responses for the 20 experimental items and the 20 control items separately as a measure of overall hindsight bias magnitude for each set of items. The type of item (experimental vs. control) was treated as a repeated measure.

2.2.4. Relationship between performance on vignette task and trivia task

For the purposes of testing whether there was a relationship between a participants' performance on the vignette task and the trivia task, I calculated two indices (one for each task) reflecting overall hindsight bias magnitude for each task. For the vignette task, I calculated difference scores between participants' hindsight bias magnitude on the consistent and inconsistent vignette outcomes:

$$\text{Hindsight bias on consistent outcome} - \text{Hindsight bias on inconsistent outcomes}$$

For the trivia task, I calculated difference scores between participants' hindsight bias magnitude on the experimental and control items:

$$\text{Hindsight bias on experimental items} - \text{Hindsight bias on control items}$$

2.3. Procedure

Figure 1 depicts the study procedure. This two-part study was conducted in groups of up to 10 participants per session for both session one and session two, with the two sessions separated by roughly a week-long delay ($M_{\text{delay}} = 7.08$ days, $\text{Range}_{\text{delay}} = 6 - 10$ days). The first session lasted approximately 30 minutes and the second session lasted roughly 60 minutes, for a total of 90 minutes.

2.3.1. Session one

Participants first gave their informed consent and then completed a demographic questionnaire. Next, participants were administered the vignette describing the relationship between Barbara and Jack, which they were told was a case history of a woman who had agreed to be interviewed about an important event in her life as part of a study examining significant life experiences. Before reading the vignette, each participant was assigned to receive one of two further instructions regarding the perspective from which they should read the vignette. The instructions were clearly outlined at the beginning of the vignette and were also read aloud to participants. Participants were either assigned to the “self” or “other” perspective condition.

Participants in the “self” condition, were instructed to read the description of Barbara and the story of her relationship with Jack from a first-person perspective, as if they were Barbara and were actually experiencing everything she experienced in the story they read. Participants in the “other” condition, were instructed to read the description of Barbara and the story of her relationship with Jack from a third-person perspective, only evaluating the events that were described. The research sessions were blocked according to which perspective participants were instructed to read the vignette from so that all participants in a given session were reading the vignette from the same perspective. The sessions were blocked by perspective condition because I believed it might have been challenging for participants to understand the instructions. Thus, by blocking by perspective condition, I could read the instructions aloud to the group of participants and allow them the opportunity to ask questions about how they were expected to read the vignette in case they were unsure.

Immediately after reading the vignette, participants rated the likelihood of four possible outcomes to the vignette on nine-point rating scales; again, these outcomes were: (1) Jack proposed to Barbara (positive outcome), (2) Jack raped Barbara (negative outcome), (3) Jack and Barbara began dating (filler outcome) or (4) Jack and Barbara had

a one-night stand (filler outcome). These likelihood judgments, made prior to learning outcome information, were participants' *original judgments* for the vignette task.

Once participants made their original judgments about the likelihood of each outcome, they completed a trivia task consisting of 40 questions. The instructions for this task informed participants that the questions were testing their general knowledge. The items were projected on a screen one at a time, automatically changing to the next question after 20 seconds, thus controlling for how much time participants had to answer each question. These initial responses (i.e., before learning the correct judgments) to the trivia questions served as participants' *original judgments* for the trivia task.

2.3.2. Session two

At the start of the second session, participants were randomly assigned to one of three outcome conditions. Two-thirds of participants learned one of two outcomes to the vignette they read in the first session: (1) a positive outcome (Jack proposed to Barbara), or (2) a negative outcome (Jack raped Barbara), and one-third of participants did not learn an outcome. Immediately after learning the outcome to the vignette or at the beginning of the session for those who did not learn an outcome, participants completed a memory questionnaire consisting of 52 true/false items. Again, 24 of the items assessed participants' memory for what occurred in the vignette, while 28 of the items assessed whether participants misremembered details about the event that were stereotypically consistent with the proposal and rape outcomes. Participants indicated whether the items were presented in the vignette they read by circling either "true" or "false" on the response sheet. They also indicated how confident they were that the item was either true or false by assigning a confidence rating to each of their answers on a scale ranging between 50% (just guessing) to 100% (completely certain) (note: confidence ratings were taken in Carli's study to be used in a mediation analyses assessing outcome condition and hindsight bias. The mediation analyses are not central to my hypotheses, therefore, I did not use these ratings for data analyses. I only included these ratings as a way of maintaining consistency in the procedure for replication purposes).

Next, participants in the positive and negative outcome conditions were once again reminded of the actual outcome to Barbara's story, and were asked to recall their original likelihood ratings (i.e., their ratings before they learned the actual outcome) for the four possible outcomes to the vignette. Of course, a reminder was not issued to participants in the no outcome condition. Once participants completed this questionnaire, they learned the correct answers to either the first half (1-20) or second half (21-40) of the items on the trivia task. The trivia items were once again projected on a screen, one at a time, for 20 seconds each. This time, the correct answers were presented underneath the respective questions for half the items. Participants were asked to indicate what their original judgment was for each item immediately after reading the correct judgment for that particular item. They were also asked to recall their original judgments for the items for which they did not learn the correct judgments. Finally, participants were fully debriefed, and asked to indicate whether they still wanted their data to be analyzed given the element of deception used in the study. Because of the sensitive nature of the negative outcome that some participants learned, they were reminded to seek help from the counselling center if they experienced any distress as a result of participating in the study. However, no participants were visibly distressed during the study session.

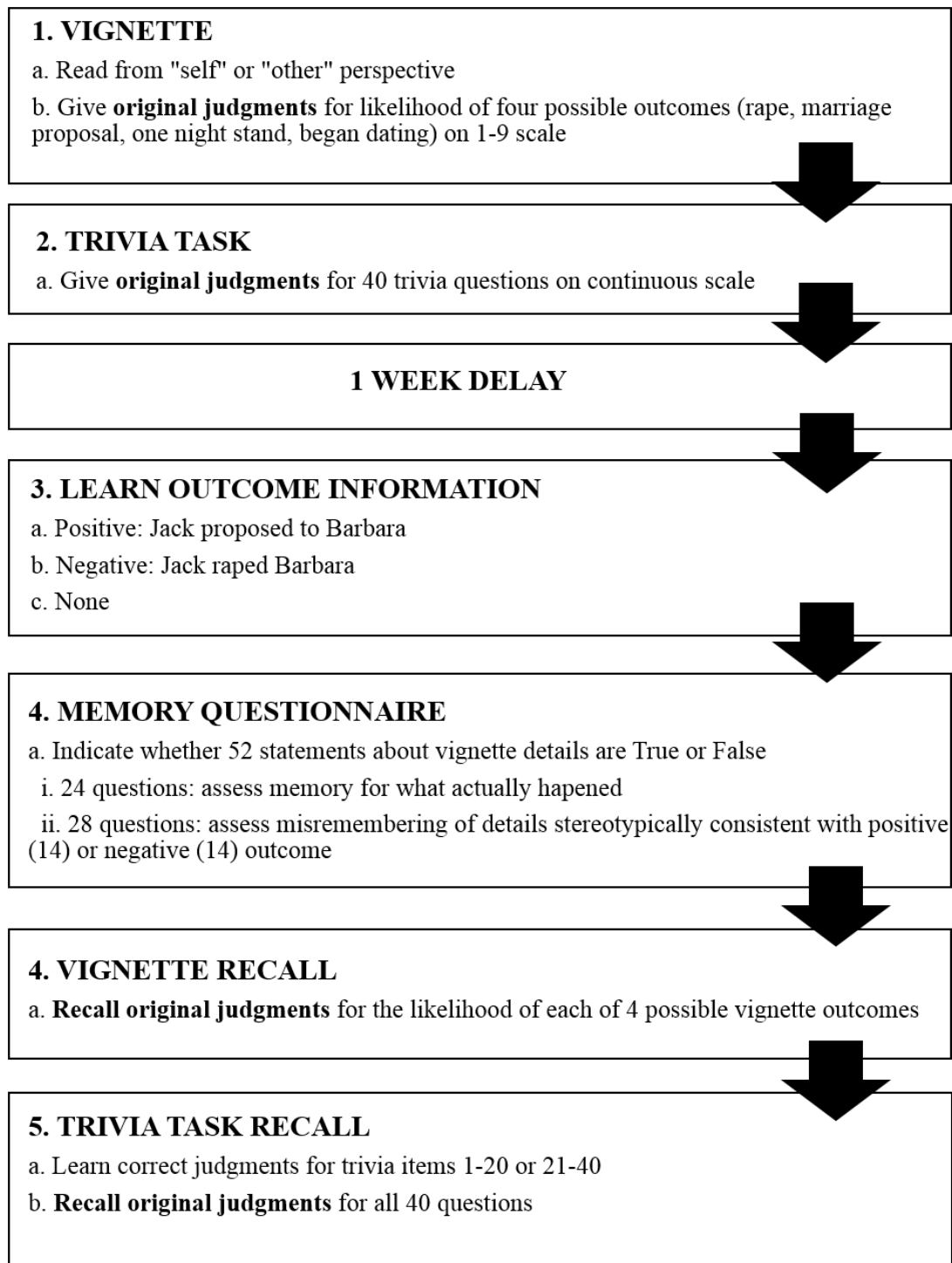


Figure 1. Study Procedure

Chapter 3.

Results

3.1. Vignette Task

I conducted a reliability analysis of the consistent and inconsistent vignette outcomes to determine the internal consistency of the measures used to assess hindsight bias on the vignette task. The inconsistent outcomes were reverse coded. The analysis revealed poor internal consistency (Cronbach's $\alpha = .08$) among the vignette outcomes.

To investigate the effects of outcome and perspective on hindsight bias, I conducted a 3 (outcome: positive vs. negative vs. none) x 2 (perspective: self vs. other) ANOVA in which outcome and perspective were the between-subjects factors and hindsight bias magnitude was the dependent variable. The mean hindsight bias magnitude that participants exhibited is presented as a function of outcome and perspective in Table 2. There were no significant differences in hindsight bias magnitude between the self and other perspective conditions [$F(1, 145) = .05, p = .83$] as is depicted in Figure 2.

There was a main effect of outcome, $F(2, 145) = 8.52, p < .001, \eta_p^2 = .11$. As seen in Figure 3, Tukey's post-hoc analyses revealed no significant differences in hindsight bias magnitude between the no outcome condition ($M = .25, SD = 2.64$) and the positive outcome condition ($M = .38, SD = 2.09$). However, there were significant differences in hindsight bias magnitude between the negative outcome condition ($M = 1.95, SD = 2.09$) and the no outcome condition, $p = .001$, and between the negative outcome condition and the positive outcome condition, $p = .002$. Thus, only participants in the negative outcome condition exhibited hindsight bias. There was no significant interaction between perspective and outcome, $F(2, 145) = .27, p = .77$.

Table 2. Mean hindsight bias magnitude (and standard deviations) as a function of outcome and perspective condition on the vignette task.

Outcome	Perspective		
	<u>Self</u>	<u>Other</u>	<u>Total</u>
No Outcome	.04 (2.79)	.49 (2.51)	.25 (2.64)
Positive Outcome	.38 (2.52)	.38 (1.65)	.38 (2.09)
Negative Outcome	2.06 (2.18)	1.85 (2.03)	1.95 (2.09)

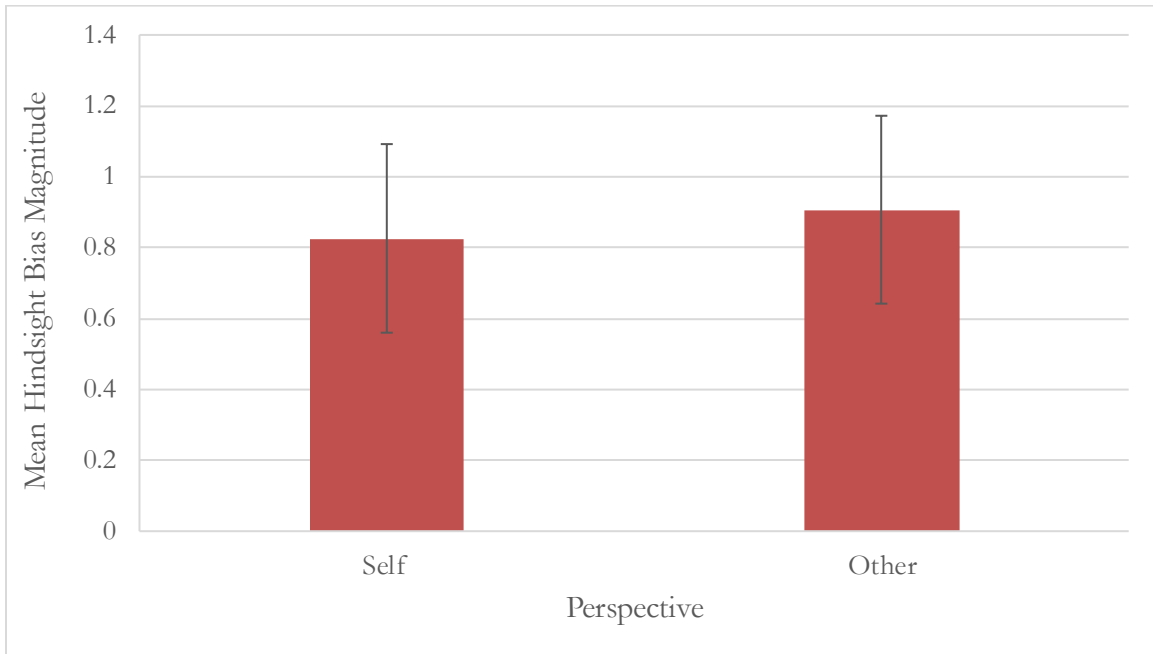


Figure 2. Mean hindsight bias magnitude as a function of perspective condition (collapsed across outcome). Error bars represent standard error.

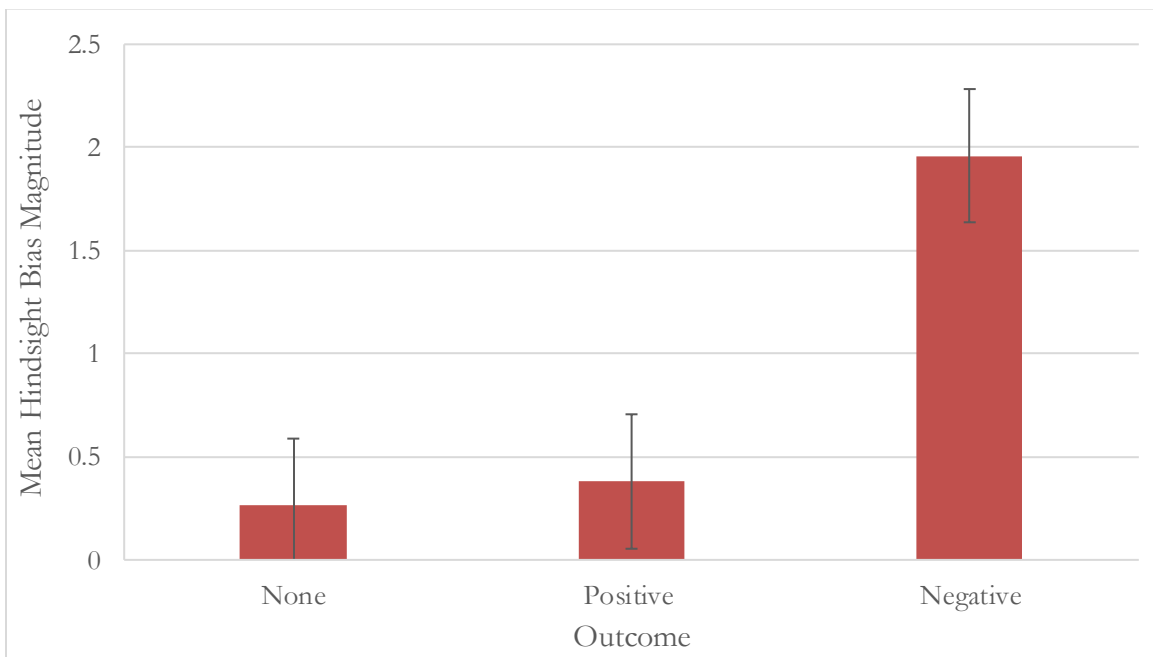


Figure 3. Mean hindsight bias magnitude as a function of outcome (collapsed across perspective). Error bars represent standard error.

3.2. Relationship between Hindsight Bias on the Vignette Task and the Trivia Task

Before conducting a correlation test between participants' performance on the vignette task and the trivia task, I conducted scale analyses on the trivia task to determine the internal consistency of the trivia items. To do so, I separated the first half of the trivia items from the second half of the items for analyses. Furthermore, I separated participants based on whether they learned the correct judgments to the first half or the second half of the items. For the first half of the items, I analyzed the internal consistency of responses among only those participants who learned the correct judgments to the first half of the trivia items. Conversely, for the second half of the items, I analyzed the internal consistency of responses among only those participants who learned the correct judgments to the second half of the trivia items. The eight least reliable items were dropped from each half of the items, resulting in 16 items dropped in total. The internal consistency of the first half of the items was satisfactory, with a Cronbach's α of .74. Unfortunately, the internal consistency of the second half of items did not reach this same satisfactory level, with a Cronbach's α of .48.

Next, I tested whether participants exhibited hindsight bias on the standard hindsight bias task—the trivia task. I conducted a paired samples t-test to compare hindsight bias magnitude on experimental and control items. As expected, this revealed a significant difference in hindsight bias magnitude between the experimental ($M = .12$, $SD = .09$) and control ($M = .08$, $SD = .07$) items, $t(150) = 4.38$, $p < .001$, $d = .36$.

To determine whether there was a relationship between participants' performance on the vignette task and the trivia task, I constructed a scatter plot of the overall magnitude of hindsight bias that participants exhibited on each task (see Figure 4). Preliminary analyses revealed no linear association between the magnitude of hindsight bias that participants exhibited on the vignette task and the magnitude of hindsight bias they exhibited on the trivia task. A Kendall's tau-b correlation revealed no significant

association between the magnitude of hindsight bias that participants exhibited on the vignette outcomes and trivia items, $r(149) = .05, p = .39$.

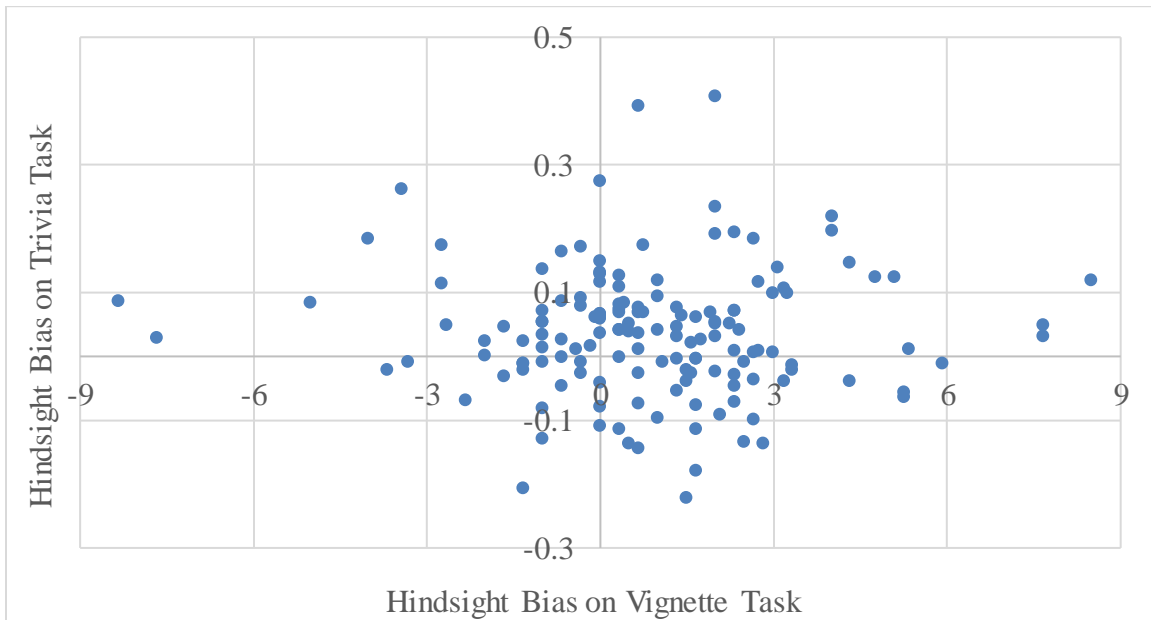


Figure 4. Association between participants' hindsight bias magnitude on vignette task and trivia task.

3.3. Memory Questionnaire

Finally, I examined responses on the memory questionnaire to determine whether participants who learned outcome information misremembered details about the vignette that were stereotypically consistent with the outcome they learned. First, I conducted a 3 (outcome: positive vs. negative vs. none) x 2 (perspective: self vs. other) ANOVA with the mean percentage of correct answers to the 24 memory items as the dependent variable. Results revealed no significant differences between the positive ($M = .66, SD = .09$), negative ($M = .66, SD = .10$), and no ($M = .65, SD = .09$) outcome conditions in the average percentage of correct answers for the memory items, $F(2,145) = .22, p = .81$. There were also no differences between the self ($M = .67, SD = .10$) and other ($M = .65, SD = .09$) perspective conditions, $F(1,145) = 1.09, p = .30$.

In order to assess whether participants misremembered details stereotypically consistent with the outcome they learned, I conducted 3 (outcome: positive vs. negative vs. none) x 2 (perspective: self vs. other) x 2 (type of detail misremembered: positive vs. negative) mixed ANOVA in which perspective and outcome were the between-subjects factors, the type of stereotypically consistent detail misremembered was the within-subject factor, and the average percentage of stereotypically consistent details misremembered was the dependent variable. Table 3 displays the average percentage of positive and negative stereotypically consistent details misremembered as a function of perspective and outcome condition.

There were no significant differences in the average percentage of stereotypically consistent details misremembered between the self and other perspective conditions, $F(1, 145) = .87, p = .35$. There were also no significant differences between the positive, negative, and no outcome conditions on the average percentage of stereotypically consistent details misremembered, $F(2, 145) = .06, p = .95$. Finally, there were no significant effects of type of stereotypically consistent details misremembered or interaction effects of perspective, outcome, or type of detail misremembered.

Table 3. Mean percentage of positive and negative stereotypically consistent details (and standard deviations) misremembered as a function of perspective condition and outcome.

	Positive Stereotypically Consistent Details	
	Self	Other
No Outcome	32.1% (17.3%)	37.3% (16.3%)
Positive Outcome	38.0% (11.6%)	32.4% (16.6%)
Negative Outcome	36.9% (12.7%)	31.3% (15.3%)
	Negative Stereotypically Consistent Details	
	Self	Other
No Outcome	33.2% (10.3%)	33.5% (15.9%)

Positive Outcome	33.4% (15.5%)	29.7% (15.5%)
Negative Outcome	33.1% (12.7%)	32.1% (16.6%)

Chapter 4.

Discussion

In the current study, I attempted to replicate and extend Carli's (1999) findings that individuals show hindsight bias consistent with the outcome information they learn as well as misremember antecedent events stereotypically consistent with the outcome they learn. I also sought to investigate two factors that seem to underlie motivational explanations of hindsight bias: outcome valence and outcome self-relevance. To test the effects of outcome valence on hindsight bias, participants either learned positive, negative, or no outcome information before attempting to recall their original predictions about the likelihood of various outcomes. Furthermore, because past research has revealed a difference in hindsight bias for self-relevant outcomes, I added a perspective (self vs. other) manipulation to the vignette to assess whether hindsight bias differed among participants for whom the outcome varied in self-relevance. Rather than using a hypothetical design to test these effects, I used a memory design and also included a standard hindsight bias task (trivia task) to measure participants' propensity to exhibit hindsight bias.

4.1. The Role of Outcome Valence on Vignette Task Performance

Outcome valence influenced participants' recall of their original likelihood ratings for the various vignette outcomes. Participants in the negative outcome condition exhibited hindsight bias, recalling their original judgments for the consistent outcome as being greater than their original judgments were, and recalling their original judgments for the inconsistent outcomes as being lower than their original judgments were. However, participants in the positive outcome condition exhibited no hindsight bias. While their recalled judgments shifted slightly in the expected direction (i.e., they recalled their original judgments for the consistent outcome as being marginally greater than they recalled their original judgments for the inconsistent outcomes), this difference was not significant, nor did it differ from participants' responses in the no outcome condition.

Though some research suggests that individuals show increased hindsight bias for negative outcome information as compared to positive or neutral outcome information, Carli (1999) found that participants who learned positive outcome information exhibited hindsight bias for the positive outcome to the same degree as participants in the negative outcome condition exhibited hindsight bias for the negative outcome. There are several possible explanations for why participants in the positive outcome condition in the current study were not influenced by their knowledge of the positive outcome. Carli's study was conducted nearly two decades ago and it is possible that due to differences in societal expectations today, participants in the current study found it hard to believe the proposal outcome. To explore this possibility, I compared participants' mean original likelihood ratings for the positive and negative outcomes. Overall, participants originally judged the likelihood of the proposal outcome as significantly lower than the likelihood of the rape outcome. This finding indicates that participants in this study found the proposal outcome more unexpected than the rape outcome.

Some literature (see e.g., Ofir & Mazursky, 1997) posits that hindsight bias may not occur when an outcome is extremely unexpected. After learning outcome information, individuals typically engage in a sense-making process to understand the outcome and why it occurred. This often leads to increased hindsight bias, as explanations that support the outcome become more obvious to an individual, while alternative outcomes, and thus details unrelated to the actual outcome, seem less likely (Pezzo & Pezzo, 2007). However, when an outcome is extremely unexpected, individuals may find it challenging to make sense of the outcome. This likely instills the belief that they could not have foreseen that outcome, making them more likely to remember their original judgments about the outcome.

My discrepant finding that the positive outcome information did not lead to hindsight bias might also be attributed to the fact that I used a memory design in the current study rather than a hypothetical design, as was used in Carli's study. Research typically shows that hypothetical designs produce larger hindsight bias effects than memory designs (Campbell & Tesser, 1983; Pohl, 2007; Powell, 1988; Wood, 1978). In hypothetical

designs, participants are never explicitly asked to make a judgment about the outcome before learning the actual outcome. Thus, they may not generate their own judgments about the outcome before learning the actual outcome. Participants in the current memory design were forced to consider several possible outcomes before learning the actual outcome. As a result, the actual outcome may seem more obvious to participants in a hypothetical design than a memory design. There may be a qualitative difference between recalling one's original judgments after learning outcome information and imagining how one would have responded had he/she not known the actual outcome.

Along those same lines, there is evidence that hindsight bias is comprised of three components: foreseeability, inevitability, and memory distortion (Blank et al., 2008; Blank & Peters, 2010; Nestler et al., 2010). These three components can be distinguished from one another, and can contribute to hindsight bias in different ways. Of the three components, it is most likely that Carli measured inevitability, because she asked participants to predict the likelihood of each outcome after learning the actual outcome. Alternatively, participants in the current study were asked to recall their original judgments after learning outcome information. While there may have been an inevitability component to the judgments participants made in the current study, their recall of their original judgments is more likely a measure of memory distortion. Thus, differences in the type of component measured, along with differences in how believable participants perceived the outcomes to be, may have contributed to differences in observed hindsight bias.

4.2. The Role of Self-Relevance on Vignette Task Performance

Despite my predictions that participants in the self-perspective condition would exhibit hindsight bias to a greater degree than those in the other-perspective condition, there were no differences between these two perspective conditions. While discrepancies remain in the literature regarding whether self-relevant outcomes lead to increased or decreased hindsight bias, research has demonstrated that there are at least *differences* in hindsight bias for self-relevant outcomes versus outcomes that another person has

experienced. In this study, however, I did not observe differences in hindsight bias for outcomes that were intended to be made more self-relevant through taking the perspective of the person who experienced the outcomes.

Perhaps taking the perspective of another person when evaluating an outcome they experienced is insufficient for increasing the self-relevance of the outcome to the extent needed to affect hindsight bias. Participants indicated that they understood the perspective from which they were supposed to read the vignette; however, there were no differences in hindsight bias as a result of the perspective manipulation. Blank and Peters (2010) found similar results in a study that investigated the effects of outcome self-relevance, outcome controllability (high vs. low) and hindsight component being measured (foreseeability vs. inevitability). Some participants were assigned to read a vignette from the actor's perspective, while others were assigned to read the vignette from an observer's perspective. Participants assigned to the actor's perspective indicated that they identified with the actor. Despite this, they exhibited little difference from participants in the observer perspective condition on judgments of foreseeability when the outcome was low in controllability, as well as on judgments of inevitability. Actually experiencing an outcome is certainly different from imagining experiencing that outcome. Thus, it may be the case that manipulating self-relevance of the outcome through perspective-taking is not as effective as manipulating self-relevance through personally experiencing an outcome, and therefore, may not influence hindsight bias in the same manner.

It is also possible that perspective-taking has little effect on the memory distortion component of hindsight bias. In both perspective conditions, participants made original judgments about four outcomes that they later attempted to recall. Though participants could have effectively taken their assigned perspectives when reading the vignette, their ability to recall their original judgments after learning outcome information may have remained unaffected. Perhaps differences in hindsight bias for self-relevant outcomes versus outcomes relevant to another person only arise from measuring hindsight bias in terms of foreseeability or inevitability. In fact, Blank and Peters (2010) attribute discrepant findings about whether individuals exhibit increased or decreased hindsight bias for

negative self-relevant outcomes to differences in the hindsight component being measured. They suggest that hindsight bias may decrease for negative self-relevant outcomes when the foreseeability component is being measured. Alternatively, negative self-relevant outcomes may result in increased hindsight bias if the inevitability component is being measured. Therefore, perhaps no differences in hindsight bias were observed between the perspective conditions in the current study because the self-relevance of the outcome did not affect the memory distortion component.

4.3. Relationship between Performance on Vignette Task and Trivia Task

Participants performed as expected on the standard trivia task used to measure hindsight bias. On items for which participants learned the correct judgments, they recalled their original judgments as being closer to the correct judgments than their original judgments actually were. Alternatively, on items for which participants did not learn the correct judgments, their recall of their original judgments was less consistent with the correct judgments. Because the trivia task is a standard paradigm for measuring hindsight bias, I expected that participants' propensity to exhibit hindsight bias on this task would correlate with their propensity to exhibit hindsight bias on the vignette task. However, there was no correlation between participants' performance on the vignette task and the standard hindsight bias task.

It is possible that there is a difference between the way in which judgments are made on these two tasks. For example, there is likely little personal investment in the correct answer to a trivia question. However, with the vignette outcomes, participants may have more deeply encoded their original judgment because they had to consider the various details of the vignette they read in order to judge the likelihood of each of the outcomes. This deeper encoding may have led to better recall of their original judgments. Therefore, participants did not exhibit hindsight bias to the same degree on the vignette task as they did on the trivia task.

It is also possible that the vignette task involved some degree of the inevitability component of hindsight bias whereas for the trivia task, just the memory distortion component was involved. On the vignette task, participants must predict the likelihood of several outcomes based on the events described. This judgment likely involves some consideration of the probability of each outcome. Though participants are asked to recall their original judgment after learning outcome information on the vignette task, a task that certainly involves the memory distortion component, this may involve some reflection on one's original beliefs about the inevitability of each outcome. Conversely, on the trivia task, participants are asked questions on which they likely have little to base their answers. Thus, they likely guess on many of the questions, and when asked to recall their answers after learning the correct judgment, try to recollect their previous answers without necessarily considering how "probable" their response was.

Differences in rating scales for the vignette task versus the trivia task could have also contributed to their lack of correlation. On the vignette task, participants were constrained to a nine-point rating scale whereas on the trivia task, they were not constrained to a rating scale. Because they only had to remember a single rating between 1 and 9 on the vignette task, it was likely much easier for them to remember their original judgments for the vignette outcomes than for the trivia judgements. Also, there were ten times the number of items on the trivia task than there were on the vignette task. Thus, there was substantially more interference on the trivia task than there was on the vignette task, likely making it much more challenging for participants to remember their original judgments for the trivia items than for the vignette outcomes. Perhaps there would be a greater correlation between the two tasks if the vignette task consisted of a greater number of possible outcomes as well as a larger rating scale.

4.4. The Role of Outcome Valence and Self-Relevance on Memory Questionnaire Performance

In the current study, there were no significant differences in the average percentage of stereotypically consistent details that participants misremembered between the outcome conditions. This finding is inconsistent with what Carli discovered in her study. Carli found that participants misremembered a significant number of details stereotypically consistent with the outcome information they learned, and further, that the more stereotypically consistent details participants misremembered, the greater the hindsight bias they exhibited. My finding is also inconsistent with what would be expected based on the sense-making process that often occurs as a result of learning outcome information. Research typically finds that in an effort to make sense of an outcome, participants often link antecedent events that explain the outcome to the outcome they learned (Blank & Nestler, 2007; Nestler et al., 2008), perhaps even when those antecedents did not actually occur (Carli, 1999).

The fact that participants in the current study did not misremember a significant percentage of stereotypically consistent details might once again be attributed to the fact that participants in the current study were asked to make two separate judgments about the outcome of the vignette. Because participants had to make original judgments about the likelihood of each outcome before learning outcome information, they may have considered the events that occurred in the vignette more extensively in order to judge the likelihood of the various outcomes. Alternatively, in Carli's study, participants learned right after reading the vignette what the actual outcome was. Thus, they may have immediately begun imagining why that outcome occurred, which may have contributed to their tendency to misremember details stereotypically consistent with the outcome they learned. The increased consideration participants in the current study likely gave to the details described in the vignette may have led them to encode the details more deeply. This, in turn, might have made it easier for them to remember the specific details of the vignette, making them better equipped to discriminate the stereotypically consistent details that were not presented in the vignette from those details that were actually presented.

It could also be the case that, again, due to differences in societal expectations in the present day from those of nearly two decades ago, antecedents stereotypically associated with rape or marriage proposals today differ from those presented in Carli's study. Carli's was one of the few (see also Lindholm, Sjöberg, and Memon, 2014; study 2) studies to demonstrate that participants misremembered antecedents stereotypically associated with the outcome they learned. However, it is important to understand whether the sense-making process associated with hindsight bias can actually lead individuals to misremember, or "cognitively reconstruct," antecedents stereotypically associated with the outcome.

Chapter 5.

Limitations and Future Directions

There are several limitations that may have contributed to the findings in this study. First, the internal consistency of the vignette task was low. Given that there were only two items (consistent outcome and inconsistent outcomes) used to measure hindsight bias on the vignette task, it is possible that the small number of items contributed to low internal consistency. Results should, therefore, be interpreted in light of this limitation. Second, the internal consistency of the first half of the trivia items was notably stronger than that of the second half of the trivia items. It seems that the items presented in the second half of the trivia task did not measure hindsight bias as reliably as the items presented in the first half. While results revealed a significant hindsight bias effect on the trivia items, perhaps differences in reliability between the two halves of the trivia task led to smaller effects than would have otherwise been observed had the second half of items achieved higher reliability. Furthermore, the trivia questions used in this study were adopted from those used in previous studies (Bayen et al., 2006; Coolin et al., 2014; Hardt & Pohl, 2003) in which significant hindsight bias effects were observed. Thus, I expected these items to measure hindsight bias reliably. However, because I observed poorer reliability on the second half of the trivia items than the first half, the results should be interpreted with this limitation in mind.

Another limitation is that there were no differences in hindsight bias as a result of perspective-taking. This finding stands in contrast to other research on hindsight bias for self-relevant outcomes which typically demonstrates differences in hindsight bias between individuals for whom an outcome is self-relevant, and those for whom it is not. It is possible that the perspective manipulation was not strong enough to increase the self-relevance of the outcome for participants in the self-perspective condition. Other than instructing participants to read the vignette from either a first-person or third-person perspective, there were no other differences in how the vignette was presented between the two perspective

conditions. Because there were no other changes made to the vignette for participants in the self-perspective condition, it may have been challenging for them to assume Barbara's perspective. If there are differences in hindsight bias as a result of evaluating an outcome from a self perspective versus an other perspective, it may be necessary to further manipulate the content of the vignette between the two perspective conditions to detect these differences.

For example, perhaps further modifying the way in which the vignette is written will allow participants in the self-perspective condition to more effectively take the first-person perspective and participants in the other perspective to more effectively take the third-person perspective. The vignette is currently written from a first-person perspective (e.g., "I met Jack the first day of classes."), which may have made it challenging for participants in the other-perspective condition to read the vignette from a third-person perspective. Perhaps if the vignette had been written from a strictly third-person point of view (e.g., "Barbara met Jack the first day of classes."), participants in the other perspective condition would have been able to more effectively evaluate the vignette from an outsider's perspective.

Alternatively, when we read about another person's experiences, and they are written from that person's perspective, it may be that our default is to read about these experiences from our own perspective. For example, some research shows that when adopting the perspective of another person, we may egocentrically interpret their perspective (Epley, Morewedge, & Keysar, 2004; Keysar, 1994). Epley, Keysar, van Boven, and Gilovich (2004) posit that when we attempt to adopt another person's perspective, we do not fully set aside our own perspective; rather, we use our own perspective as an anchor for another person's perspective. Thus, as Apperly (2009) suggests, errors in perspective-taking "tend to consist of reporting one's own belief, desire, or knowledge rather than that of the target person whose perspective you are supposed to be taking (p. 5). In that case, it may have been challenging for participants in the self-perspective condition to imagine themselves as Barbara.

Perhaps, then, it may have been more effective for participants in the self-perspective condition to be presented with a vignette written in a second-person perspective (e.g., “you met Jack the first day of classes”). Blank and Peters (2010) found that this was an effective strategy. In their study, participants were assigned to read a scenario from either an actor or observer perspective. Participants assigned to the actor perspective read the scenario from a second-person perspective whereas participants assigned to the observer perspective read the scenario from a third-person perspective. Participants in the actor condition reported relatively high identification with the actor ($M = 6.8$ on a 9-point rating scale). Thus, it is possible that using second-person language may have made it easier for participants in the self-perspective condition to imagine themselves as the main character in the vignette. Future research should examine the most effective ways to manipulate perspective, including how to modify the vignette to make it less effortful to take the first-person perspective of another person. Future research should also consider whether administering another measure, such as an empathy measure, would be useful in assessing participants’ ability to take perspectives, and further, whether their performance on such a measure would correlate with their hindsight bias magnitude on the vignette task.

Another limitation is that instead of personally experiencing an event to increase its self-relevance, participants in this study imagined experiencing an event. Despite the fact that imagining experiencing an event is different from actually experiencing an event, it is still important to consider whether perspective-taking may influence hindsight bias. There are many situations in which we must attempt to take the perspective of another person to assess what they could have known in the past. If individuals can effectively take the perspective of another person, they may be able to gauge the foreseeability and/or inevitability of an outcome more effectively, and in turn, be more understanding about an outcome that another person has experienced. If individuals cannot take the perspective of another person, they may be more likely to exhibit hindsight bias when evaluating an outcome another person has experienced, especially when the outcome is negative. The latter case might be consistent with research suggesting that when people imagine themselves in negative situations, they view themselves as invulnerable when compared to

another, unknown person (Perloff & Fetzner, 1986). Thus, they may be more judgmental of the person's behaviors and less empathetic for the outcome.

To continue to sort out discrepant findings about how self-relevant outcomes influence hindsight bias, future work should consider the hindsight component being measured. There seems to be evidence that whether a self-relevant outcome leads to differences in hindsight bias may depend on the component being measured. For example, it seems that hindsight bias may decrease when a negative self-relevant outcome is measured using the foreseeability component, but increase when measured by the inevitability component. Furthermore, there may be little difference in hindsight bias between a negative self-relevant outcome and a negative outcome that is not self-relevant when the memory distortion component is used as a measure. It also remains unclear whether hindsight bias for a positive self-relevant outcome may vary as a result of the component being measured. Therefore, investigating these differences may help to sort out this anomaly in the literature.

In Carli's study, participants misremembered a significant number of stereotypically consistent antecedent details after making hypothetical hindsight judgments. This finding did not hold true in the current study, which employed a memory design instead of a hypothetical design. It is possible that because the memory design requires participants to make original judgments, they more deeply encode the events that precede the outcome. Future research should consider whether the memory design or the hypothetical design more closely resembles hindsight judgments made in the real world. If the hypothetical design more closely resembles real-world reflections on the past (which may be the case given that in many situations, people are unlikely to make original judgments about an outcome), people may be more likely to misremember antecedent events than is suggested by the results of this study.

Chapter 6.

Conclusion

It is important to consider whether there are differences in hindsight bias for self-relevant outcomes. It is also important to consider whether there are differences in hindsight bias for positive versus negative outcomes. Few studies have directly investigated differences in hindsight bias between positive and negative outcomes varying in self-relevance (Louie, Curren, & Harich, 2000; Mark et al., 2003). The current study sought to extend our understanding of hindsight bias that arises from evaluating positive and negative self-relevant outcomes versus evaluating positive and negative outcomes that another person has experienced. There were no differences in hindsight bias for outcomes intended to vary in self-relevance as a result of manipulating the perspective from which participants evaluated the outcome. Thus, future research is needed to determine whether there are differences in hindsight bias for positive and negative outcomes varying in self-relevance, and whether these differences can be detected by manipulating self-relevance through perspective-taking.

This study has important implications. First, this study demonstrates that even with a memory design, which typically leads to smaller hindsight bias effects than a hypothetical design, people exhibit hindsight bias after learning a negative outcome. This is an important finding, particularly when considering the implications this has for legal judgments. The majority of legal judgments arise from a negative outcome, and triers of fact are typically aware of the nature of the outcome when they are making judgments (Giroux et al., in press; Harley, 2007). However, triers of fact are often asked to ignore the severity of the negative outcome when making judgments about how responsible the defendant is, and are only supposed to consider the defendant's actions and/or what the defendant knew prior to the negative outcome. For example, when evaluating a case in negligence, triers must determine the defendant's behavior prior to an outcome without considering the actual outcome. Unfortunately, it may not be possible for triers to disregard their knowledge of a

negative outcome when evaluating the events that preceded the outcome. Therefore, their knowledge of the negative outcome is likely to influence their judgments about a defendant's actions, leading to biased legal judgments (Caplan, Posner, & Cheney, 1991; Evelo & Greene, 2013; Hastie & Viscusi, 1998; LaBine & LaBine, 1996).

Evaluating what another person knew or how they acted prior to an outcome likely involves some degree of perspective-taking, or at least, attempting to take a different perspective. For example, when triers evaluate a defendant's actions that preceded a negative outcome (i.e., an offense), they must consider what the defendant could have known and whether this knowledge justified their actions. This process should theoretically involve attempting to take the perspective of the defendant to evaluate what he/she could have known. We did not find any differences in hindsight bias between the perspective conditions; thus, it could be that people are just as good at taking others' perspectives as they are at taking their own. However, this is unlikely given what other research has found about the egocentric nature in which individuals take another's perspective (Apperly, 2009; Epley et al., 2004).

Alternatively, it may be the case that individuals cannot fully take the perspective of another person when evaluating the other person's past beliefs or actions. Future research should explore this possibility. People may automatically revert to their own perspective of the events, which is influenced by outcome knowledge. If one cannot ignore a negative outcome to consider another person's knowledge, beliefs, or actions prior to the outcome, this may bias legal judgments. It is important to sort out whether the lack of variation among the perspective conditions can be attributed to the fact that people were unable to effectively take the perspective of another person, or because people were just as good at taking another person's perspective as they were at taking their own. This could elucidate whether asking triers to consider what a defendant could have known prior to an outcome might be an effective debiasing strategy. If people are unable to take the perspective of the defendant, they are likely unable to effectively consider what the defendant could have known prior to the outcome.

Considering the nature of the particular negative outcome in this study more specifically, the findings can also potentially illuminate cases involving sexual assault. Research on sexual assault often finds that people assign blame to the victim for the offense, and judge the victim's behaviors leading up to the outcome as making them partially responsible for the outcome. Some researchers have argued that victim blame may arise from hindsight bias (Carli, 1999; Carli & Leonard, 1989; Janoff-Bulman, Timko, & Carli, 1985); if a negative outcome is perceived as more foreseeable in hindsight, people may believe that victim was capable of preventing the outcome. The current study's findings seem to suggest that individuals are likely to judge an outcome, specifically rape, as more likely in hindsight than in foresight. Though we did not measure whether participants exhibited victim blame, it is possible that they may attribute some responsibility for the outcome to the victim in the scenario, Barbara. Future work should consider whether victims may also blame themselves for a negative outcome, particularly in the case of rape, and exhibit increased hindsight bias ("I should have known that was going to happen to me").

Much remains to be discovered about how the self-relevance of an outcome as well as outcome valence impact hindsight bias. While future studies would continue to benefit from researching this question by manipulating whether participants actually experience an event or evaluate an event another person has experienced, research might also benefit from determining whether self-relevance, and subsequently hindsight bias, can be manipulated through perspective-taking. Perspective-taking is an essential aspect of our lives and understanding if and how it impacts hindsight bias might be an important development in understanding how we evaluate self-relevant outcomes differently from outcomes that affect others. This could have important implications for settings in which perspective-taking may be necessary to reduce biased decisions.

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Appendix A.

Vignette

Instructions for “self” perspective condition:

Read the following case history of a woman named Barbara. First, you will read a description of Barbara, then you will read a story about Barbara’s relationship with a man named Jack. Read the scenario from a first-person perspective, imagining that you are actually Barbara, and that you are actually experiencing everything Barbara experiences in the story below.

Instructions for “other” perspective condition:

Read the following case history of a woman named Barbara. First, you will read a description of Barbara, then you will read a story about Barbara’s relationship with a man named Jack. Read the scenario from a third-person perspective, as if you are an evaluator of the story she describes, and are assessing the events that occur in the story below.

Description of Barbara:

Barbara Crow lives in Vancouver. She is 24, single, and recently moved from her parents’ home into her own apartment. She works as an account executive’s assistant in a large accounting firm. She is working for her MBA and goes to school nights.

Barbara is very close to her family, probably stemming from her traditional Catholic upbringing. Her father works for the Canadian government and her mother is an accountant. She has two older brothers, 28 and 26, and a younger sister who is 13. Her family traveled often when she was younger and spent a lot of time together on the ski slopes. They own a chalet at Whistler, which has always been Barbara’s second home. Barbara loves skiing and during University, worked at a ski resort.

Barbara travels frequently for her job and enjoys any opportunity to explore new places. After college, she traveled cross-country with her friends and has been to Europe several times.

Barbara graduated with honors as an accounting-finance major from a prestigious university. She was editor of the yearbook and played intramural sports.

Barbara enjoys meeting new people. She frequently goes out dancing and to movies, plays and concerts. Barbara dates but hasn’t had any serious boyfriends in the past.

She heard about our research from a former coworker and volunteered to be interviewed. The events in the interview took place about one year earlier.

This is Barbara's story, taken from transcripts of two interviews with her. It has been edited only to give it chronological coherence and to remove any identifying information.

Barbara's Relationship with Jack:

I met Jack the first day of classes. Or rather, I noticed him. I was tired from a long day of work and really didn't want to go to class. But since I wanted to get my MBA, I had to go.

Jack was the first person who stood out in our class. He seemed much more comfortable and at ease than the rest of us. He laughed and joked in class and even our professor had to crack a smile. As the semester progressed, it was evident that Jack was very intelligent, too. He always seemed to know the answer, I thought in a confident way, not like a show-off. I remember watching him a lot, the way he talked and moved and laughed.

One time when the professor made fun of him, he snapped back, very angry and upset. I felt bad for him. I suppose that's when I realized how attracted to him I was. It was more like a far-away crush, though; I never thought I would have the opportunity to get to know him.

But in the middle of the semester, we were assigned to a project together. It dealt with analyzing and predicting stock market trends for the next month and a half. I remember that at the time, I couldn't believe it. I was actually going to be working with him, spending time together. I was excited. I started imagining all sorts of things but eventually I realized that I had to play it cool. The project was very important. We had to do a good job on it.

As the weeks went by we settled into a pattern. We would work on the project several times a week then go for coffee and a doughnut, and spend some time socializing. I thought we hit it off well. We always seemed to have something to talk about, whether it was the project, class, our jobs, whatever. As it turned out, Jack was an avid skier. We spent a lot of time talking about different slopes and things. I would go home with a smile. Thinking about him made me happy. But I couldn't tell at all how he felt about me. Jack seemed friendly to everyone. At the time I thought he might have felt more for me, but it might have been just a special friendship. I couldn't decide if I should say something. I didn't want to ruin our friendship if he didn't feel anything for me. And I didn't want to look stupid.

One night I decided to ask him. But before I could we had an awful argument at the restaurant. The waiter had brought over our coffee but I guess something was wrong with Jack's. I don't remember anymore what it was, maybe too much cream. Anyway, Jack called the waiter over and started to really chew him out. I didn't think it was such a big deal and said so. Jack turned on me and said, "Who asked you?" in a really cold voice. I was nearly frightened, but mostly angry. I snapped back at him and he yelled at me, right

there in the restaurant. I couldn't believe. I got up and walked home alone, in the dead of night. I even cried. The next day he called me at work and apologized. Later, I didn't think that much about it.

At the end of the semester, we finished our project and went out to celebrate. We stayed out all night, talking and laughing. I thought it was incredible the way we were getting along. I was thinking that something was going to happen, or that he might say something to me about us, but he never did. And I was too nervous of what he might say if I brought it up.

Then right in the middle of talking about skiing, he asked me if I would like to go with him to his parents' lodge at Whistler for a ski weekend. I was excited—of course I accepted. But I was nervous; I mean, what did I really know about him? But I thought it would be all right.

We drove up that Friday after work. It was a long drive and though we talked a lot, I could tell something was on his mind. I didn't ask about it though. When we got there, we went to dinner at a steak house. I had one glass of wine, which made me very sleepy. When we got the ski lodge, I was dozing off. Jack seemed worn, too. The lodge was warm and I just wanted to go to sleep. Jack brought my bags in and showed me my bedroom. At the door he looked at me strangely. I waited and then on impulse, I kissed him. I didn't know what he thought of me, but I was too tired to think about it.

The next day the weather was incredible. The snow was perfect and Jack was a really good skier. We had a great time, and though it was cold, we moved around enough to keep warm. At the end of the day, Jack said he was going to take me somewhere special for dinner. We showered and changed at the lodge and I put on a new outfit that I had bought just for the occasion. I felt and looked good. I thought, maybe this is the night.

We went to dinner in town and it was wonderful. He said I looked beautiful and sexy. Dinner was delicious and the wine perfect. It seemed so romantic. And one point he reached across the table and held my hand. He seemed as if he was about to say something, but he didn't. When we got back to the lodge, he began saying how much he had enjoyed the time we spent together and how much he had looked forward to this weekend. He squeezed my hand and told me that I was sexy and attractive. He said he had fallen in love with me and asked me what I thought of him. I told him I cared for him, too. He started kissing me.

Appendix B.

Vignette Outcomes

1. Jack Raped Barbara

Not at all likely	1	2	3	4	5	6	7	8	9	Very Likely
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2. Jack and Barbara began dating

Not at all likely	1	2	3	4	5	6	7	8	9	Very Likely
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3. Jack proposed marriage to Barbara

Not at all likely	1	2	3	4	5	6	7	8	9	Very Likely
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4. Jack and Barbara had a one-night stand

Not at all likely	1	2	3	4	5	6	7	8	9	Very Likely
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Appendix C.

Outcome Information

Positive Outcome

Last week, you read a case history of a woman named Barbara. The following statement is the actual ending to Barbara's story:

"It was then that he sat me on the couch and asked me to marry him."

Negative Outcome

Last week, you read a case history of a woman named Barbara. The following statement is the actual ending to Barbara's story:

"It was then that he pushed me down on the couch and raped me."

Appendix D.

Memory Questionnaire Items (and correct responses)

1. Jack and Barbara stayed out all night after finishing their project. (true)
2. Barbara and Jack gazed at each other often. (positive antecedent)
3. Jack kissed Barbara the first night at the ski lodge. (false)
4. Barbara met many men at parties. (negative antecedent)
5. Barbara goes to night school. (true)
6. Jack and Barbara often went out drinking after work. (negative antecedent)
7. Barbara asked Jack to go skiing. (false)
8. Barbara and Jack stayed at a friend's place for a weekend. (false)
9. Barbara and Jack had been dating for a while. (positive antecedent)
10. Barbara's family skies. (true)
11. Barbara wore sexy clothing when she saw Jack. (negative antecedent)
12. Barbara told Jack she cared for him. (true)
13. Barbara and Jack dined by candlelight. (positive antecedent)
14. Jack once walked out on Barbara. (false)
15. Jack gave Barbara a dozen roses. (positive antecedent)
16. Barbara was a tease. (negative antecedent)
17. Barbara and Jack argued at a restaurant. (true)
18. Barbara and Jack worked together several times a week. (true)
19. Jack liked to drink. (negative antecedent)
20. Barbara has three siblings. (true)
21. Barbara and Jack met at a bar. (negative antecedent)
22. Jack didn't talk much in class. (false)
23. Barbara was sexually indiscriminate. (negative antecedent)
24. Barbara was nervous about going on the ski weekend. (true)

25. Barbara wanted Jack to come onto her. (negative antecedent)
26. Jack told Barbara that she looked sexy. (true)
27. Barbara and Jack dined with soft music in the background. (positive antecedent)
28. Jack had a violent temper. (negative antecedent)
29. Barbara and Jack studied course material together. (false)
30. Jack was very religious. (positive antecedent)
31. Barbara turned Jack on. (negative antecedent)
32. Jack took Barbara to New Hampshire. (false)
33. Barbara had sexual fantasies about Jack. (negative antecedent)
34. Barbara likes to go out dancing. (true)
35. Jack was aggressive. (negative antecedent)
36. Jack gave Barbara a ring. (positive antecedent)
37. Barbara plays piano. (false)
38. Jack and Barbara met through a mutual friend. (positive antecedent)
39. Barbara works for an accounting firm. (true)
40. Barbara wanted a family very much. (positive antecedent)
41. Barbara hated watching TV. (false)
42. Barbara and Jack dined at a table with a beautiful view of the mountains. (positive antecedent)
43. Barbara's father works for the Canadian government. (true)
44. Jack was very well mannered. (positive antecedent)
45. Barbara went to a community college. (false)
46. Jack wanted Barbara to meet his parents. (positive antecedent)
47. Barbara's mother is a housewife. (false)
48. Jack loved children. (positive antecedent)
49. Barbara wore lots of makeup (negative antecedent)
50. Barbara and Jack received an A on their project. (false)
51. Jack was unpopular with women. (negative antecedent)

52. Jack lit a fire at the lodge. (positive antecedent)

Appendix E.

Trivia Task Items (and correct responses)

1. At what temperature does copper melt? (2,415 Celsius)
2. How high is the Statue of Liberty including its base? (93 meters)
3. What is the distance between New York and Los Angeles (by road)? (4,546 kilometers)
4. In what year was the monkey wrench invented? (1841)
5. In what year was the harmonica invented? (1821)
6. How long is the Rhine River? (1,320 kilometers)
7. What year did the Hundred Years' War begin? (1339)
8. What year was the lightning rod invented? (1752)
9. How long is the Great Wall of China? (3,460 kilometers)
10. What year were X-rays discovered? (1895)
11. What is the average depth of the Pacific Ocean? (3,940meters)
12. On average, how many days is a female elephant's pregnancy? (631 days)
13. How long is the Amazon River? (6,556 kilometers)
14. How long is the Mississippi River? (3,779 kilometers)
15. What year did William Herschel discover the planet Uranus? (1781)
16. In what year was Jane Austin's Pride and Prejudice first published? (1813)
17. What is the average temperature of the Antarctic winter? (-68 Celsius)
18. What is the highest temperature ever measured on Earth? (57 Celsius)
19. What percentage of the world's population was under the age of five in 1995? (7.7%)
20. How long is the world's longest bridge? (38.42 kilometers)
21. What year did Sir James Dewar, an English chemist, invent the thermos flask? (1873)
22. How many carats is the world's largest reported diamond? (3,106 carats)

23. How many days does the planet Mercury take to make one trip around the sun? (88 days)
24. What percentage of the world's population lived in Africa in 1994? (12.4%)
25. How many plays did William Shakespeare write? (37 plays)
26. When travelling 97 kilometers per hour in a car, how much room should you allow yourself to brake? (83 meters)
27. What is the distance between Tokyo and Chicago (by air)? (10,137 kilometers)
28. What year was the parking meter invented? (1935)
29. What year did Leonardo da Vinci create Mona Lisa? (1503)
30. What year did Albert Einstein formulate the theory of relativity? (1903)
31. What is the diameter of the planet Mars? (6,787 kilometers)
32. How high is the highest point on Mount Kilimanjaro? (5,895 meters)
33. What year were the first modern-day Olympic games celebrated? (1896)
34. What percentage of the world's population lived in Europe in 1994? (9%)
35. How many muscles does the human body have? (639 muscles)
36. What percentage of the human body is composed of nitrogen? (8.5%)
37. What year was the first mailbox invented? (1653)
38. When was slavery officially abolished in the United States? (1865)
39. How many films did Alfred Hitchcock direct? (56 films)
40. How many detective books did Agatha Christie write? (67 books)